DECEMBER
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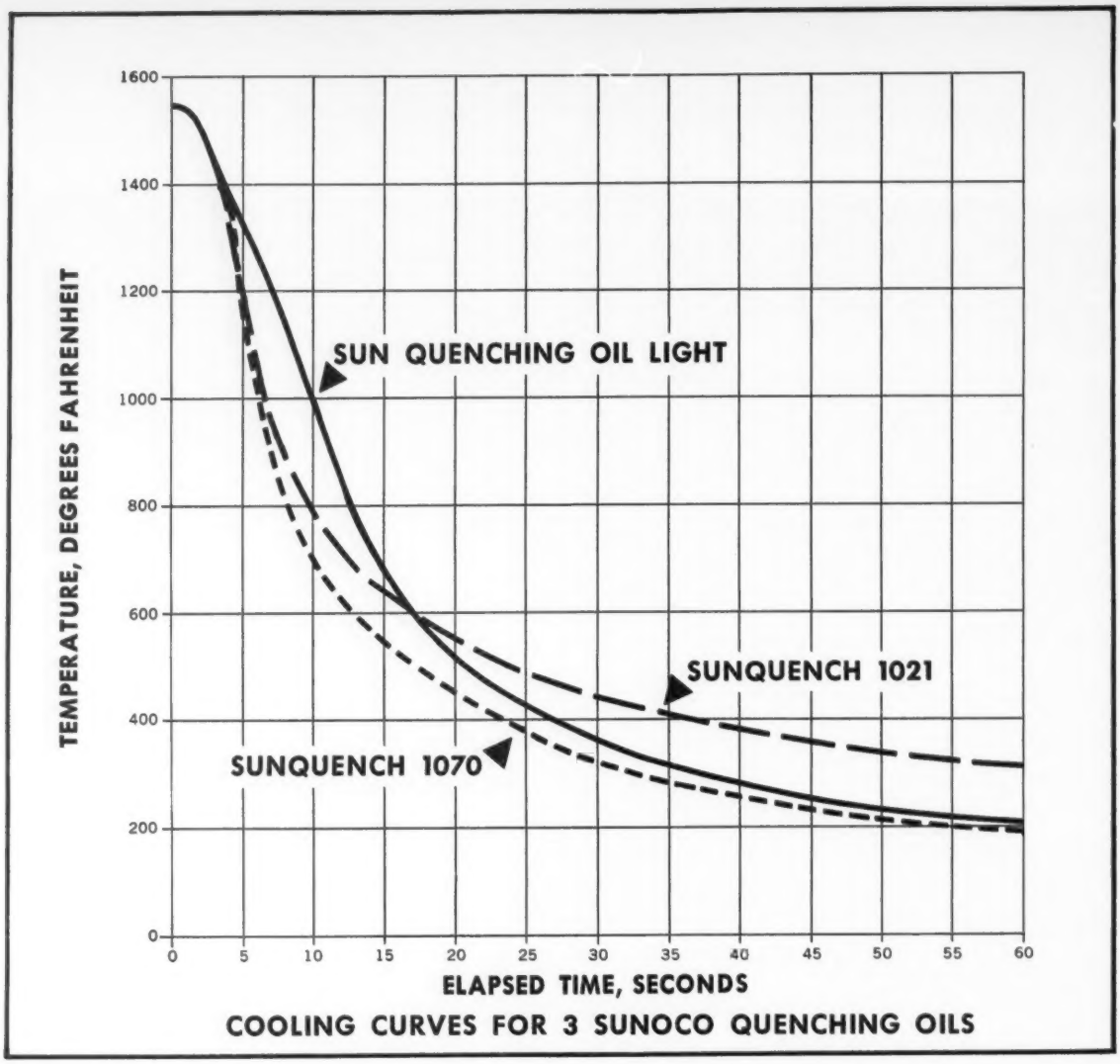
Vol. 12 #6

Metal Treating

THE *ONLY* MAGAZINE DEVOTED EXCLUSIVELY TO THE HEAT TREATING INDUSTRY



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Metal Treating

THE ONLY MAGAZINE DEVOTED EXCLUSIVELY TO THE HEAT TREATING INDUSTRY

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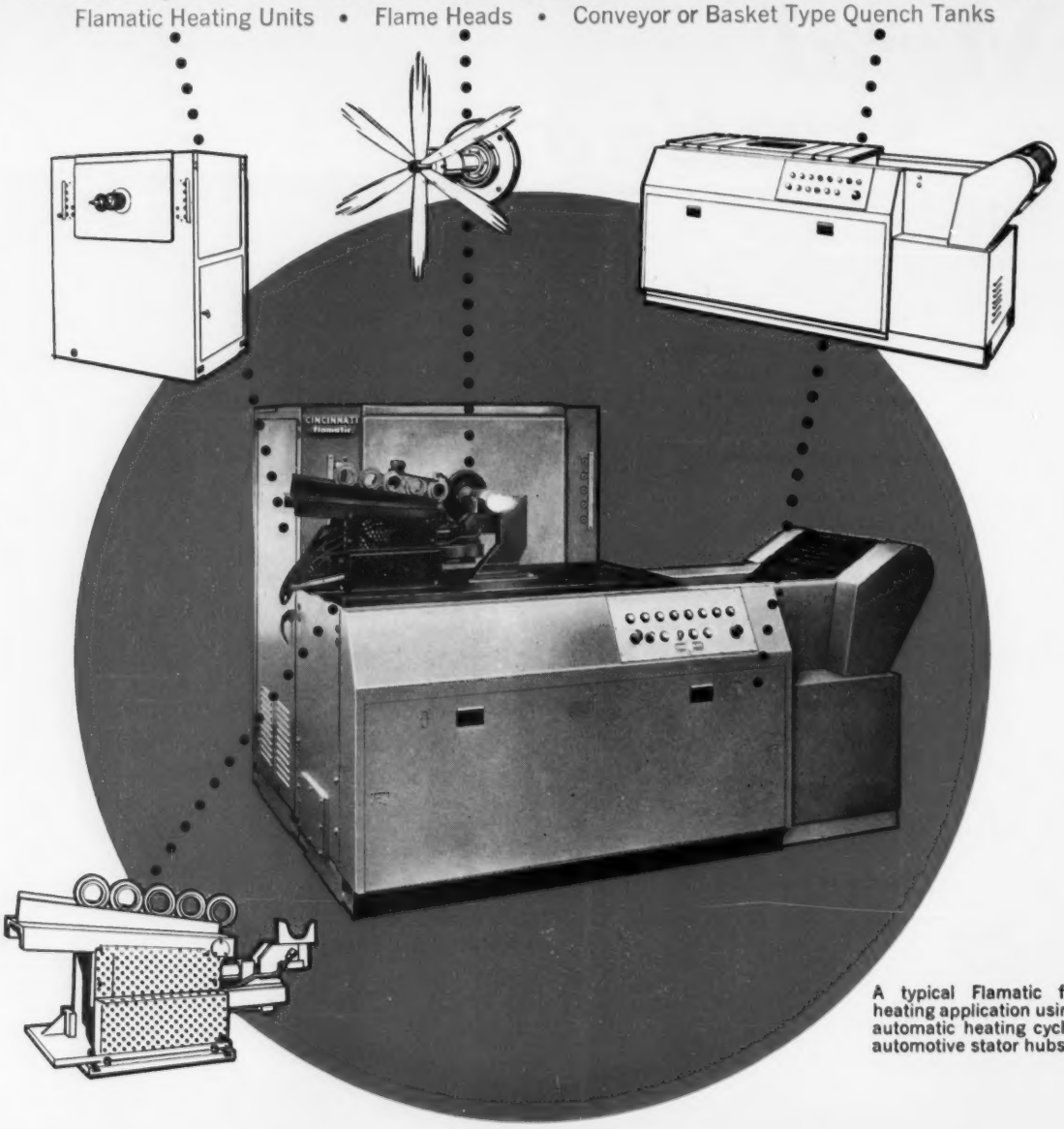
About Our Cover

Effective commercial heat treating of stamped, swaged, or drop forged parts in the unmachined condition has many ramifications. How a Paris, France heat treater handles the problems in this field is told on page 15.

Work Handling Devices • Natural Gas Boosting Equipment • Electronic Temperature Controls
Flamatic Heating Units • Flame Heads • Conveyor or Basket Type Quench Tanks



A typical Flamatic flame heating application using an automatic heating cycle for automotive stator hubs.

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Steel

Tool Steel Topics

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With this system a standard punch card is the job ticket. The metallurgical department punches it to set up treatment factors for desired result. When the work arrives at the furnace the operator merely puts the card in the Robotrol panel. He can't treat the work without putting the card in. He can't put it in wrong. He doesn't have to read or set instruments, adjust dew points, time carburizing and diffusing periods, decide on type and timing of quench. The punch card controls these automatically. It can provide for a variety of operations and required cautionary procedures. As the work moves on and is completed the punch card provides a permanent record of the exact treatment given it.

CONCEPT IN HEAT TREATING TECHNIQUE.

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For the first time automatic quality control in heat treating

System completely eliminates factor of furnace operator error

Provides exact record of metallurgical treatment on every job

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Guarantees you precise uniformity and quality in heat treating

Introduced at the recent ASM Show at Detroit, this new Lindberg Robotrol automatic quality control system has been in development for more than five years. With this punch card system pyrometers, timers, atmosphere control instruments and all the factors on which metallurgical results are dependent are set up and automatically controlled. It is practically impossible for the furnace operator to treat the work improperly.

The punch card also provides an exact record of the treatment given each job. You know exactly what happened.

The Robotrol system is extremely flexible and can be adapted to any kind of heat treating cycle. For full information consult your local Lindberg Field Representative (see classified phone book) or write us direct.

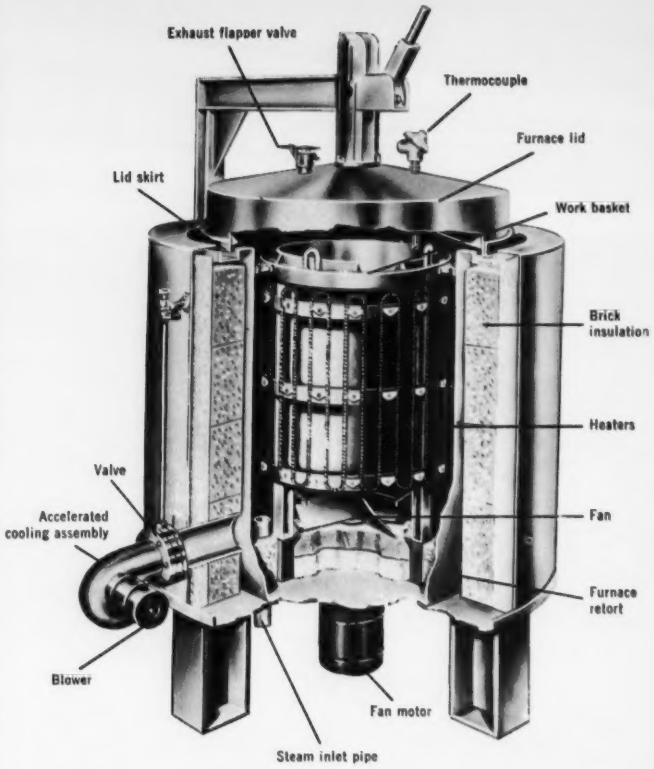
For further information circle No. 4

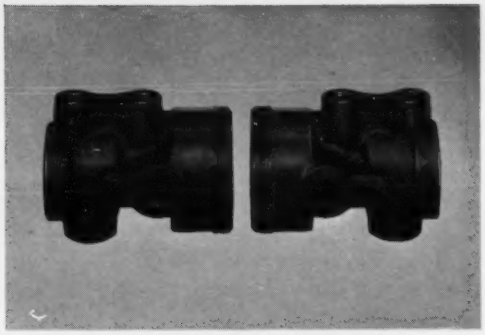
IS STEAM TREATING AN UNKNOWN QUANTITY TO YOU?

If you work with metal . . . ferrous or non-ferrous . . . and haven't considered steam atmosphere heat treating for your product, you may find you've overlooked an unsuspected source of surprisingly substantial savings. On the opposite page are just four examples to illustrate our point. If you want others . . . or details on any of these . . . or want us to help investigate possible savings you can make, just phone your nearest L&N office or write us at 4999 Stenton Ave., Phila. 44, Pa. Catalog TD2-620(1) tells all about it, too; we'll be glad to send you a copy.

LEEDS & NORTHRUP

Pioneers in Precision



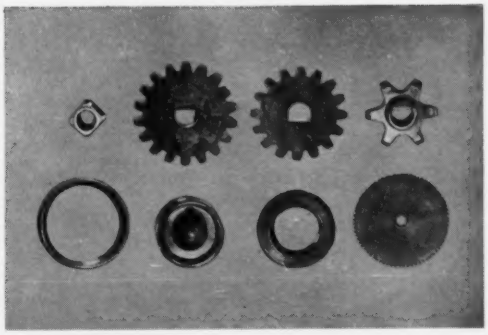


REPLACES CADMIUM PLATING . . . These grey cast iron valve bodies are used in the pneumatically operated sanders that deliver sand for improved traction under the wheels of trains, trolleys and trucks. Their manufacturer had a double-barreled problem . . . porosity in the castings was causing excessive rejects . . . expensive cadmium plating was necessary to prevent corrosion in service.

Steam treating has solved both problems in one operation. Rejects due to porosity have been eliminated, and many valves previously rejected have been salvaged. Cadmium plating has been eliminated entirely because exhaustive salt spray tests showed the steam-treated finish had a higher resistance to corrosion.

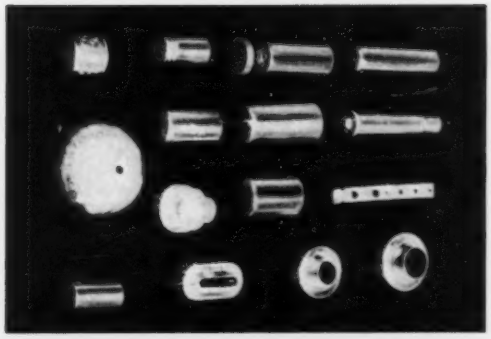
PUTS "EXTRA-LIFE" IN CUTTING TOOLS... A machinery manufacturer faced a tough problem when specifications called for milling a 0.250-inch-wide key-way slot into a piece of 4140 cold-rolled bar stock which was heat treated to a hardness of Rc 34 to 38. In addition, tolerances were tight . . . ±0.001 inch . . . with sides perfectly square.

The first high-speed steel tools used produced only four cuts and could not be resharpened because of the close tolerance. Hard-chroming the same tools improved cutter life to about 11 pieces per tool. Carbide tools held up for from 11 to 14 pieces. The next move was steam treating experimental batches of tools in an L&N furnace. The first batch averaged 100 parts per cutter, a second batch, 60 to 70 and a third lot, 100 to 125.



RAISES "PSI" OF POWDERED IRON PARTS... Although many parts made of powdered iron function satisfactorily in the as-sintered condition, there are others where an increase in hardness and compressive strength is an advantage.

This is particularly true of such parts as the steam-treated gears, cams, etc., shown above, where additional strength is needed on critical bearing surfaces. The shock-absorber piston in the center, for instance, presented a real problem . . . how to meet psi specifications for the thin-section flange around the outer edge. Steam treating proved a cheap, practical solution. Tests showed compressive strength of the flange increased from 1200 to 1400 psi. In addition, the parts, when oil dipped, had a pleasing uniform, blue-black color and high corrosion resistance.



CUTS EXPENSIVE PICKLING COSTS . . . Non-ferrous lipstick tubes and other cosmetic containers made by a large Canadian manufacturer must be annealed before finishing operations can be performed. Scale was a problem. If left on, it ruined tools and dies . . . removing it meant expensive, messy pickling.

The solution was found when sample parts were annealed by the steam Homo® method. When this method was adopted as an integral part of the production line, pickling was eliminated. Subsequent figures from the cost-accounting department showed that eliminating this operation reduced annealing cost by 53 percent.

LEEDS & NORTHRUP *Pioneers in Precision*

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Available in electrically heated or fuel fired designs. 15 standardized sizes with capacities from 175 to 3000 lbs. per hour, minimize the charges for new engineering and assure prompt delivery. Easily installed. Often shipped completely assembled requiring only connection to utilities. 7 out of every 10 new orders are from previous users attesting the serviceability and dependability of our design.

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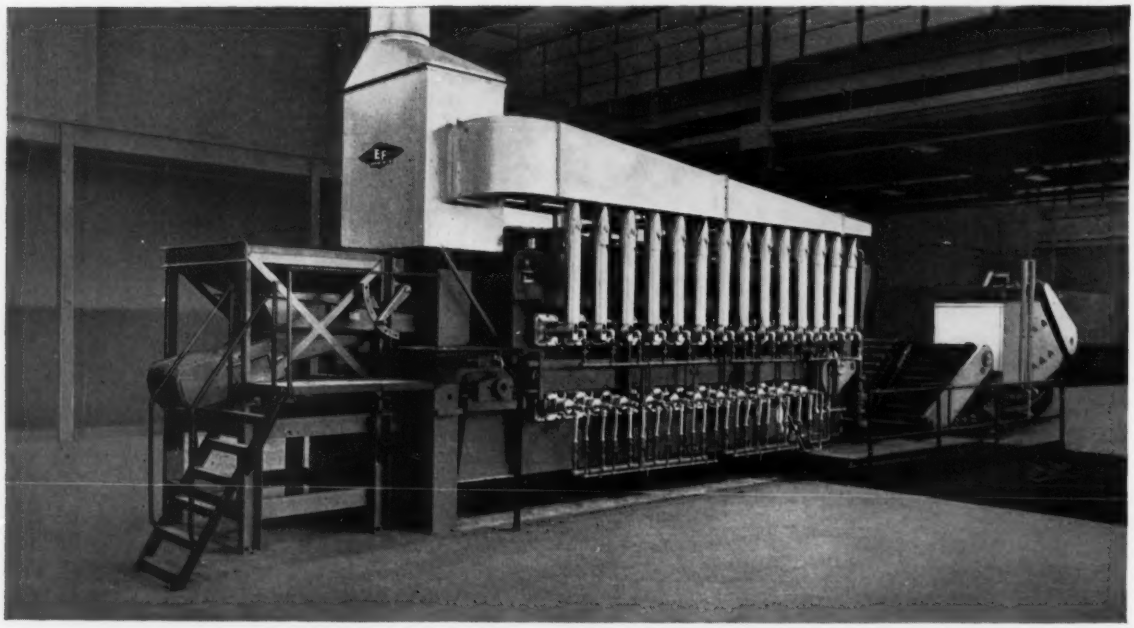

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For further information circle No. 6

Reinserting a 14-foot HK nickel-chromium alloy furnace tube at Security Engineering, Inc., Division of Dresser Industries, Dallas, Texas, after its regular six-month inspection. Upon refiring, these heavy-walled tubes bend back into their normal shape and function perfectly.

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How to select the proper heat-treating alloy. "Heat Resistant Castings, Corrosion Resistant Castings...Their Engineering Properties and Applications" discusses the entire range of heat-resistant casting alloys, and advises what to consider in choosing the right alloy for your needs. A post card will put this 72-page booklet on your desk.

*Alloy Casting Institute designation

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INCO NICKEL

makes castings perform better longer

For further information circle No. 7

Aluminum

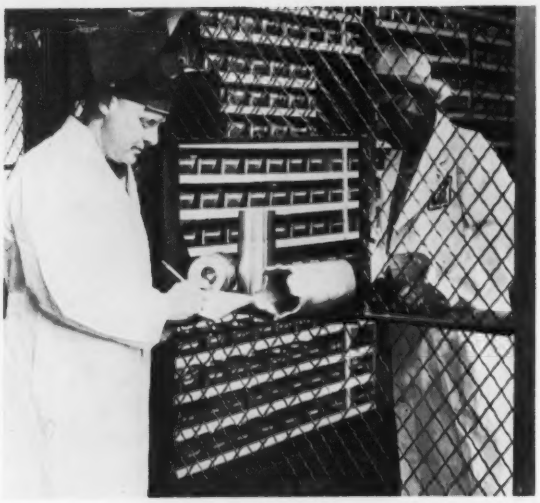


FIG. 1. Stock man issuing torsion bar tubes and plugs from stock to a welder.

FIG. 2. Bars being welded into proper alignment prior to solution heat treatment.

FIG. 3. Bars being immersed into solution for heat treatment. This step is followed by the artificial aging process.

HEAT TREATED ALUMINUM ALLOY WELDMENTS proved the key to an approximately 200 pound weight-saving in a single set of control assemblies when the Army Redstone missile was modified to become the first stage of the satellite launching Jupiter-C rocket. These same assemblies were also incorporated in the modified Redstone schedule for use in early stages of the Mercury program.

A weight saving for precious pay load was a major aim of the Army Ballistic Missiles Agency, Huntsville, Alabama, when formulating modifying the Redstone for use in space exploration projects. One major modification prescribed was replacing a 4130 steel air rudder torsion bar sprocket wheel assembly with a welded and riveted aluminum assembly. These units play a vital part in guiding the missile or rocket in flight. Parts must be extremely rigid and able to withstand the great stresses of supersonic flight.

The change from steel to heat treated aluminum was contracted, along with other modifications, for fabrication by the Reynolds Metals Company missile plant at Sheffield, Alabama. Reynolds' Sheffield plant has been fabricating missile and rocket ballistic shells and related items since 1952, both as a prime contractor to Army Ordance and as a sub-contractor to Chrysler Corporation.

The assembly consists of three major components. The rudders are riveted and welded. When in use they are actuated by a gear on the end of the torsion bar.

The torsion bar is a long tubular weldment with caps at each end. In finished form it is machined to a tolerance of .0004 in. It extends from inside the tail section through the fins to the rudders.

Bolted to the inside end of the torsion bar is a flat sprocket wheel which transmits power through heavy roller chain to the torsion bar and ultimately to the rudder.

The modified specifications on the aluminum torsion bar called for the two caps and the tubular center section to be of 6061 aluminum alloy which had been heat treated and artificially aged. Reynolds engineers studied the official Army specifications and asked, "Why not weld the three parts of the torsion bar together and then heat treat and artificially age the

Weldments

FIG. 4. Bars are machined to a close tolerance. A tolerance of .0004 in. must be maintained.

finished bar? That would make the entire assembly, including the welds, stronger and would overcome the slight annealing effect of the welding."

Heat treating was no new experience to the Reynolds plant since virtually the entire tail section of the Redstone utilizes heat treated aluminum components. The notable facet about torsion bar usage, in addition to the weight saving, was that its three parts were welded together first and later heat treated and artificially aged to give added strength.

They checked back with the Army missile and rocket authorities who agreed the after-welding heat treatment of the torsion bar would be desirable.

The accompanying pictures illustrate heat treating and fabricating of this assembly with special emphasis on the torsion bar.

The torsion bars are made of aluminum alloy 6061. After welding they are heat treated in a Lindberg pit type air furnace at 960 F. The bars are then soaked for one hour and quenched in cold water.

Following soaking and quenching, the bars are artificially aged in a Lanly hot air furnace for eight hours at 350 F. and allowed to air cool. Final machining follows. Finishes are applied and the torsion bar weldments assembled into the final tail section.

The sprocket wheel is cut from 7075-T6 aluminum alloy supplied by Reynolds.

Heat treatment of the rudder, which is also of the 6061 alloy, is the same as that of the torsion bar, except that the parts are individually heat treated since the small amount of welding required has no noticeable annealing effect.

Each of the assemblies in which heat treated aluminum replaced steel was approximately 50 pounds lighter than the original steel version. This accounted for a saving of approximately 200 pounds for the four assemblies used in each Jupiter C rocket Redstone missile.

The record of Jupiter C launched satellites orbiting around the earth is dramatic evidence that the heat treated aluminum weldments of this assembly performed more than adequately. It is also significant that Redstone missiles produced have this aluminum assembly in place of the orginally specified steel one.

FIG. 5. Engineer checking finished product to insure proper fit of torsion bar sprocket wheel assembly into the tail section.

FIG. 6. Torsion bar sprocket wheel assembly is fitted into the tail section of the modified Redstone Mercury project booster.

CARBURIZED CASE

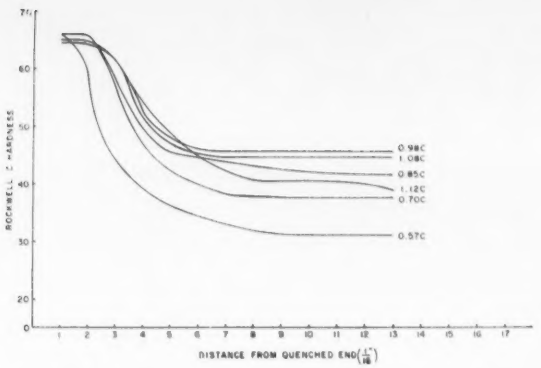


FIG. 1. Carburized hardenability of AISI — 4027 steel, Heat A, showing Rockwell C hardness.

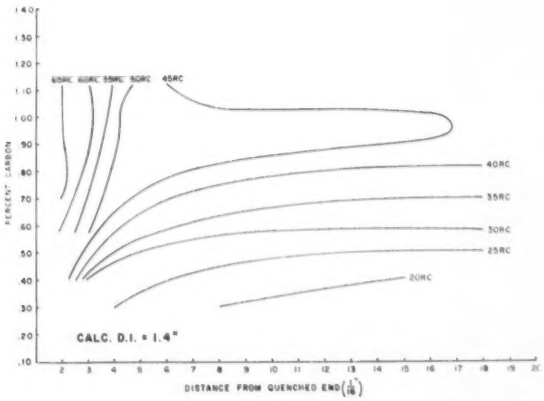


FIG. 2. Carburized hardenability of AISI — 4027 steel, Heat A, showing percent of carbon.

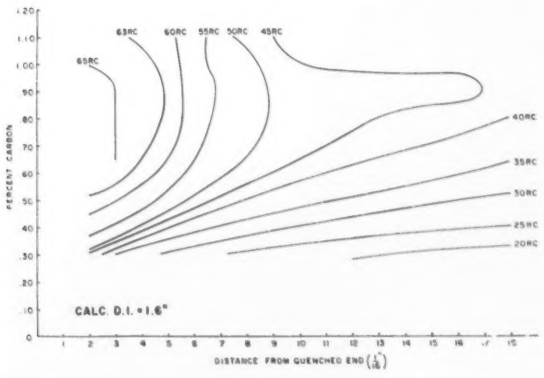


FIG. 3. Carburized hardenability of AISI — 4027 steel, Heat B.

THE CONVENTIONAL END QUENCH TEST can be used with reasonable reliability in predicting performance of a heat of steel with regard to gear core hardness. In contrast, the end quench results cannot be used with a high degree of confidence when predicting the effect of added carbon upon case hardenability. For this reason the carburized hardenability bar has gained acceptance in the metal treating industry. Information obtained on this bar, when properly interpreted, permits forecasting the heat treat performance on a heat of steel.

The method in general use—hardness vs. end distance—for plotting end quench results from the carburized bar is confusing and inadequate (Fig. 1). The criss-crossing of lines makes it difficult to follow results. In addition, it does not show clearly the optimum required added carbon for maximum case hardness and hardenability. For this reason charts of constant hardness lines vs. carbon content and cooling rate were developed and have been in use since the early 1950's.[1]

The primary purpose of adding carbon to the surface of the steel by carburizing is twofold: to increase its hardness and its ability to harden. Since hardness is the tool of measuring hardenability, it is logical that conditions of carburizing and rate of quenching should be evaluated in terms of their effect on hardness.

During the process of carburizing, one expects the highest carbon level at the surface, followed by progressively lower carbon levels until the core carbon level is reached. In turn, the surface is cooled the fastest and each inner layer of lower carbon content is progressively cooled at a slower rate during the quench. This complex situation requires an understanding of the effect of each carbon level and quenching rate upon hardness for any heat of steel regardless of composition if any degree of control is expected. Hardness and hardenability, in general, are expected to increase with carbon addition until a maximum is reached. Maximum hardness and maximum hardenability obtained by carbon addition during carburizing on a heat of steel are not always reached at the same carbon level. Further addition of carbon beyond a certain level does nothing for the steel. However, it usually requires a faster quench if the same hardness is to be maintained. Information regarding all of the phases discussed are provided in the Iso-Hardness charts (Figs. 2, 3 and 4).

[1]*Metal Treating* — May-June 1956

HARDENABILITY CHARACTERISTICS

as revealed by the iso-hardness digram

By A. E. GURLEY
Engineering Division
Chrysler Corporation

The validity of the Iso-Hardness information obtained on specimens depends upon the care and technique employed in the preparation and the analytical method of obtaining hardness and chemistry. Since the original presentation of data, considerable improvement in the technique has been developed by the mechanical testing laboratory at Chrysler Corporation. Instead of successive grinding to some predetermined depth, the carburized end quench bar is split longitudinally, slightly off-center. The off-center half is then finish ground to the exact center and case traverses are made at 1/16" intervals for the desired length. This is a time saving procedure which permits review of results.

An appraisal of the Iso-Hardness chart method of interpreting data can be made by the study of three heats of steel recently submitted to the Chrysler Corporation Lynch Road Gear and Axle Plant for the production of rear axle drive pinion gears. The customary practice is to select a quantity of forgings from each new heat submitted, regardless of chemistry and conventional hardenability results obtained on the bar stock. The purpose is to study change in tooth bearing contact and case carburizing and hardening characteristics. Production has experienced difficulties periodically and has shown that reliable forecasts of material performance cannot be predicted consistently when based on chemistry and standard hardenability.

The problem of case hardenability is recognized by our suppliers. To avoid disputes and economic losses the problem was solved by adopting a pilot testing procedure by agreement with the vendors. Six bars of rolled stock from each heat are selected at random by the mill. The bars are identified and shipped to the Chrysler forge plant along with the chemistry and end quench results. The lot is forged, annealed and shipped to the gear and axle plant for subsequent machining, carburizing and hardening. The hardness and case depth obtained on the pilot lot gears provides the basis of approval or rejection of the heat of steel.

Specific advantages of the pilot system are as follows: 1. Avoids the possible economic losses of shipping a complete heat of steel. 2. Eliminates the cost of forging an entire questionable heat. 3. Avoids undue machining costs because a large part of the heat may be finish machined or in various stages of machining before the information becomes available. 4. Permits sufficient time to investigate any questions arising from the results reported on the pilot lot. 5. Since at this point the economic stake is not great, more harmonious vendor relations are maintained.

Three production heats of steel, SAE 4027 identified as A, B, and C, were evaluated by the production plant in the customary sampling procedure. Correlation could not be made on two of the three heats of steel using the end quench hardenability bar and chemical analysis. At this point, carburized hardenability bars were run concurrently with a rear axle drive pinion pilot lot. The results were analyzed by the Iso-Hardness diagram method. This practical application pointed out in detail the particular areas of the pinion which failed to respond to the carburizing and hardening process. The reported mill analyses of the three heats of steel appear in Table 1.

TABLE 1. Chemical Analysis of Heats A, B and C

	Heat A	Heat B	Heat C	Specified Range
C	.29	.28	.30	.25 — .30
Mn	.83	.85	.83	.70 — .90
Si	.22	.23	.31	.20 — .35
Mo	.21	.23	.26	.20 — .30
Ni	—	—	.11	.20 maximum
Cr	—	—	.04	.15 maximum

From the chemical analyses, nothing unusual was noted about these three heats. In general, all would be expected to have very similar performances when subjected to carburizing and hardening. Slightly lower results would be expected on Heat A because of the slightly lower molybdenum results. Residuals (Ni and Cr) were not reported on Heats A and B.

Chrysler's specification on rear axle drive pinions

calls for a case depth range of .40 in. to .050 in. measured to 50 Rockwell C along the pitch line. The aim at the root line is for .025 in. case depth to 50 Rockwell C with an absolute minimum of .020 in. A case depth, below .020 in., at the root line is considered unacceptable and will not be approved for production assembly. A surface hardness of 60 Rockwell C minimum is also required. To meet these requirements carbon is added to the surface and diffused to the desired carbon level.

On Amola steel a surface carbon range of .80 to 1.00% has been found satisfactory for normal operation. In regular operation for the pinion gear, a carbon level range of 0.40 to 0.50% falling between .040 in. to .050 in. has been found satisfactory with the present quench. This means a minimum of 0.50% carbon level is expected to occur at the .040 in. depth. These conditions are expected to be fulfilled on a 10 hour carburizing cycle at 1700 F. Failure of production to meet case depth requirements immediately precipitates an investigation into the surface carbon level, carbon level at 0.040 to 0.050 in., quench, core hardenability and case hardenability.

Pilot lots from Heats A, B and C were processed by the Lynch Road Gear and Axle Plant on the regular ten hour carburizing cycle at 1700 F. The results appear in Table 2.

TABLE 2. Hardness and Case Depth

	Heat A	Heat B	Heat C
Surface	61 R "C"	62 R "C"	62 R "C"
Pitch	29	29	34
Root	23	21	25
Core	18	19	22
Pitch Case	.041"	.046"	.047"
Root Case	.016	.021	.026

These first results were verified by subsequent trial lots. Some of the gears failed to meet minimum root case depth requirements on Heat A and B. Additional time was added to the carburizing time cycle but the case depth was not consistently obtained on these heats. After determining that carbon penetration, quench, etc., were considered adequate, case hardenability characteristics were determined.

Samples of bar stock from Heats A, B and C were obtained and hardenability test bars and carbon concentration bars were turned to the same diameter — one inch.

Standard hardenability determinations were made on bars machined from bar stock on Heats A, B and C. A sample from each bar was also submitted for chemical analysis. Hardenability and carbon concentration bars were submitted for carburizing in the production furnaces and later for carbon analysis. The chemistry of each heat as reported from the bar stock sample is given in Table 3.

TABLE 3. Chemical Analysis and J-4 Hardness on Bar Stock

	Heat A	Heat B	Heat C
C	.30	.28	.25
Mn	.76	.82	.80
P	.016	.014	.014
S	.022	.020	.016
Si	.21	.23	.25
Cr	.054	.063	.040
Ni	Nil	Nil	.09
Mo	.21	.24	.29
J-4	24 R "C"	26 R "C"	26.5 R "C"
Calculated D.I.	1.4	1.6	1.53

The results on the carburized hardenability bars and carburized concentration bars from Heats A, B and C are plotted using constant hardness lines in Figs. 2, 3 and 4. Data presented in Table 3 indicate that these heats are very similar in composition and should be expected to perform similarly when exposed to carburizing. Heat A is a little lower in Mn and Mo and a slightly lower case depth can be expected. Heats B and C appear to be very similar, with Heat B being slightly better from the standpoint of hardenability based on composition. The calculated critical diameter for Heat B was found to be 1.6, and 1.53 for Heat C.

Carburized hardenability data presented in Figs. 2, 3 and 4 show the response of these three heats to carburizing and hardening. Their response to carburizing and hardening was different from that expected based on chemistry and conventional end quench hardenability results. Heat A lacked depth of hardening, indicated by the position of the 50 Rockwell C line in Fig. 2. The addition of carbon failed to increase its hardenability. As a result, depth of hardness was lacking. The position of the 50 Rockwell C line occurred for the .80 to .90 carbon level at the J-4 position. For satisfactory results in production on this part, it has been established that the 50 Rockwell C position must occur at a minimum of J-10 position on the test bar

Concluded on page 21

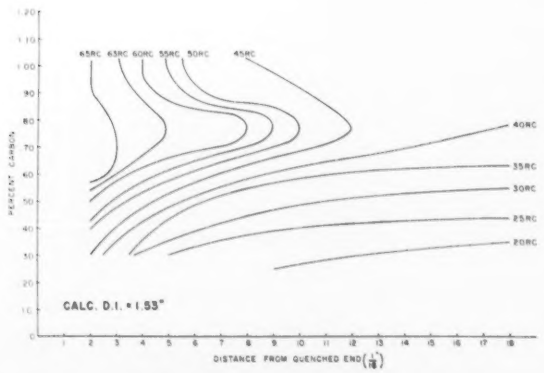


FIG. 4. Carburized hardenability of AISI — 4027 steel, Heat C.

A NEW FRENCH ACHIEVEMENT . . .

BERNARD JOUSSETT
Civil Engineer of Metallurgy and Mines
Chairman of the Societe Parisienne de Cementation
Paris, France

Commercial Heat Treating of Stamped, Swaged or Drop-Forged Parts in the Unmachined Condition

COMMERCIAL HEAT TREATING is characterized by diversity of treated parts, shapes, weights and materials. Practitioners find it extremely difficult to tell in advance all the requirements of customers, since these, too, are essentially variable. Long runs of parts involving the same material and heat treating processes are the exception rather than the rule. This is particularly true in commercial heat treating of stamped, swaged, drawn or drop-forged parts in the unmachined condition.

To meet these problems — and to solve them in the short time usually allowed — equipment must be the most universal possible and maximum mechanization compatibile with versatility must be utilized. This report will review the heat treatment of unmachined parts in light of the above criteria. Indeed, it is a field which is too often neglected because of the advances made in treating parts under controlled atmospheres or in a vacuum, either in batch type or in continuous furnaces.

The as-forged or as-stamped parts being etched or shot-blasted after heat treatment do not involve one type of protection or another. Moreover, machining or cutting allows removal of the portions eventually decarburized. Thus, it is sufficient to heat the parts as rapidly as possible, and permit completion of the entire cycle under controlled conditions.

When pursuing the heat treatment of unmachined parts it is necessary to make a choice between batch type or continuous type units. The former meet every requirement as to regularity, automation and uninterrupted completion of the operation. However, it is evident that when confined to this particular facet of commercial heat treating, this type of operation is inadequate for a commercial undertaking.

Heading the list of reasons why batch type units are not the most acceptable for this type of operation is the fact that a very large investment and high volume are necessary at all times. These conditions are present in some segments of industry such as the automobile plants but even so far as this industry is concerned there are conspicuous disadvantages. A great number of pieces in refractory steel are often in-process at one time and breakdowns or damage entailing the replacement of one piece can lead to a complete stoppage of the process.

About the only way to eliminate periodic stoppages in this type of operation is the establishment of an emergency line — or several such lines. This, however, can often double an already enormous initial cost. Further, equipment of this nature, which is not in use, deteriorates with time.

Another method of treating is through the isothermal annealing process. This is a unit which is essentially a single purpose furnace. It has limited use and serves to increase still further the outlay as an initial investment.

The above are given solely as reasons why a heat treater would not choose such equipment for this particular operation. Quite often they would not be economical since such facilities would be ill-adapted to the particular jobs which a firm might undertake outside of the real one for which they were specifically designed.

Recently a heat treating concern located in the Paris suburbs developed a method which seems to have solved the problems facing the heat treater who must deal with unmachined parts. Exhaustive tests have proved that the work turned out is consistent in accuracy and quality regardless of the quantities, sizes, and unit weight of the parts being treated.

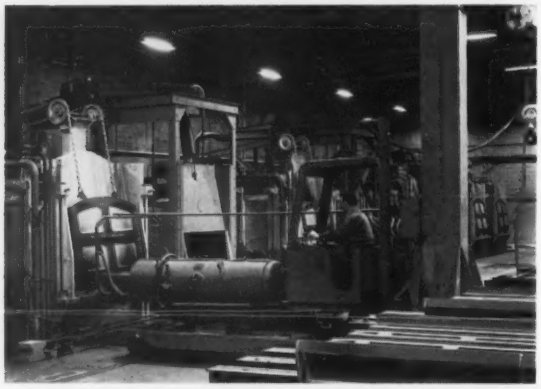
The facilities, which have replaced a bank of lean coke gas furnaces, have permitted a manpower reduction of 60% and have entirely eliminated the human element of chance in the handling of parts between various heat treating operations.

Essentially, the installation consists of a row of six furnaces which are coupled to two automatic water and oil quenching machines.

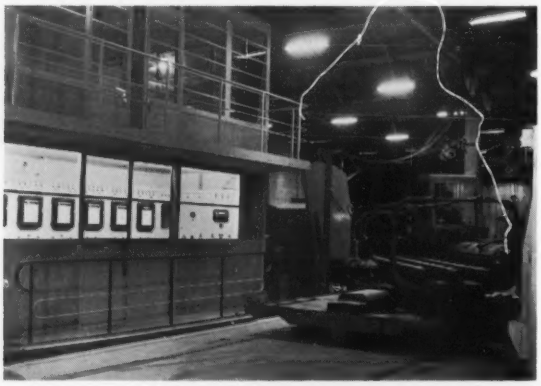
The units consist of two hardening furnaces with a capacity of reaching a temperature of 2100 F., one dual purpose furnace and three annealing furnaces. They are served, as are the two quenching machines, by a loading machine equipped with an air operated rotating platform and fitted with three arms capable of raising, lowering, loading, unloading and moving about 180 degrees a three ton batch of various parts.

This loading-unloading machine moves on two rails and serves all the front parts of the furnaces and the quenching machines. In both are several special areas designed for loading and unloading as well as a box

Heart of the installation at this Paris, France, plant are six furnaces coupled with two automatic water and oil quenching machines.



As pictured on our cover, the units here are an integral part of this French firm's growing capacity to meet the challenges of the metal treating industry.



Temperatures are controlled and electronically regulated by potentiometers placed in a dust proof control chamber.

The electronically controlled chamber contains all apparatus necessary to avoid failure in the installation.

specially designed and ventilated to carry out isothermal annealing treatments which are gaining popularity.

The handling machine receives a direct supply of compressed air through a neoprene hose wound up around a drum mounted on the workshop framework. Compressed air is used in the four basic handling operations; unfolding, folding, raising and lowering of the arms and rotation of the platform. This allows a versatility and a velocity much greater than could be attained by using electricity.

All the furnaces have a length of 116 in. by 56 in. by 24 in. In their hearths are three gutters with refractory steel flats for the rollers at the end part of the arms of the loading machine. Each furnace can accept batches weighing up to three tons. Furnaces are heated with light fuel oil by means of American thermal burners, with recycling and ejection of the gas at high speed. This enables them to burn fuel oil with the same flexibility and regularity as town gas yet ensures a high degree of temperature accuracy in the whole laboratory.

Temperatures are controlled and regulated electronically by potentiometers placed in a dust proof control chamber. In this chamber are all the apparatus and meters of various types necessary to avoid any failure in the installation. Each furnace is fitted with a draft regulating unit.

Two air compressors working in duplex with fully automatic controls provide the supply of compressed air to the pneumatic equipment. Loading machine, quenching installation, screw-jacks for the opening of the doors of the furnaces, etc., are all powered by these units.

A special feature of the oil quenching machine door is automatically operated by a screw-jack. The batch is lowered or raised and, if required, it can be also swayed during the quenching operation.

The oil, cooled outside the bath by a cooling agent in a tubular unit, enters at a high flow under the batch and leaves the bath in the upper part of the tank. In addition, the oil is stirred by three electro-agitators with high turbulence. This arrangement ensures a very homogeneous cooling of the entire batch. There is in the tank at any given moment a quantity of 25 tons of special quench oil which is always ready for use. The oil temperature is continuously recorded and controlled.

The water quenching machine is designed along the same principle, with the exception that it does not need to be closed. Water is not recovered. However, the machine may be quickly altered for quenching parts in soda water with refrigeration. Cooling of the oil and supply of cold water for the quenching machine is provided by a well which yields water at a temperature of 54 F.

Such an installation has been designed to allow the handling of batches of any importance, with emphasis on the elimination of manual labor to heat treat drop

forged, stamped, or drawn parts of different sizes.

In the main bay are two big derricks electrically driven and incorporating an electric pulley-block to which is fastened an electromagnet. This magnet is designed to lift parts from the containers brought by the fork trucks in the delivery area and then to later put them on the refractory steel trays or special stretchers.

Once the batch has been arranged on the loading tray, it will not be fractioned further. At this point it is considered as a whole which remains undivided in all the successions of heat treating operations. These facts on hand are sufficient to identify the composition and arrangement of each individual batch on a technical file card which can be used for further reference. This is an important point and one which deserves to be fully considered by the various drop-forgers and customers of the firm.

Every drop forger has his own tooling and his particular methods of production. If, for example, several drop forgers produce the same parts for the same manufacturer, the manufacturer will find it advantageous to give the parts coming from his various suppliers to the same heat treating firm, provided that this company has the facilities described, because of the reproducibility any time later of identical characteristics on all the parts supplied by many different drop forgers.

In order to illustrate further the sequence of the operations in this installation, this report will present an account of the progession of a batch of stamped parts inside the workshops.

Generally speaking, parts are delivered to the commercial heat treating shop in metal containers brought by trucks. Unloading takes place on a well equipped platform with handling equipment of every description. The containers are handled by the fork trucks. They are then weighed. The technical section draws up the series of heat treatments to take place, eventually through reference to an already existing processing card on file The batch is thus established, according to the above processes, on the loading areas.

In sequence, the following operations take place for quenching and tempering.

The loading machine comes in front of the batch, spreads its arms, lifts the batch, folds its arms, rotates about 180 degrees, moves before the hardening furnace, the door of the furnace opens automatically, the machine introduces the tray into the furnace, the machine moves back, and the door closes.

When the heating period is over, the machine returns to the front of the furnace, withdraws the batch, moves to the face of the quenching machine, inserts the batch, moves back, the door closes, and the batch falls down automatically into the oil bath.

The sequence is almost identical to extract the

Concluded on page 40

1961 MTI ANNUAL MEETING

The Annual Fall Meeting of the Metal Treating Institute was held at the Sheraton-Cadillac Hotel, Detroit, during the ASM Metal Show Week October 26-28. This was the 50th consecutive meeting of the Institute.

On the opening day of the meeting, John H. Ries, president of the Institute, made the annual presentation of the MTI Achievement Award.

This award is presented to the author of an outstanding lecture presented at the Annual Fall or Spring Meetings of the Institute, or to the author of an outstanding feature article appearing in METAL TREATING.

This year's winner was Lester F. Spencer, pictured here receiving the award from Ries, metallurgical consultant from Huntsville, Alabama, who received the Award for his article published in the June-July 1960 issue of METAL TREATING titled "Isothermal Heat Treatment: Transformational Behavior in Steels."

Following this presentation, the MTI-ASM Joint Heat Treating Session was held as part of the Metal Congress in Cobo Hall. A seven-man panel presentation discussed the topic "Can Your Costs be Reduced By Brazing Techniques?"

At the MTI Technical Session held October 27, a talk was presented by Charles T. Weintraub, of the New York law firm of Weintraub & Fass, on the subject, "A Practical Approach to Limitation of Liability in the Heat Treating Industry." This was followed Friday evening by the Annual Banquet and Dinner Dance.

The final session on Saturday morning was devoted to a business session at which the following officers and members of the Board of Trustees were unanimously elected:

President. J. H. Ries, Lakeside Steel Improvement Co., Inc., Cleveland, Ohio.

Vice President. L. J. Haga, State Heat Treat, Inc., Grand Rapids, Michigan.

Treasurer. M. Lunz, Wisconsin Steel Treating & Blasting Co., Milwaukee 15, Wisconsin. ● ● ●

UNUSUAL CAR BOTTOM ANNEALING FURNACE

DOWSON & MASON, LTD.

DOWSON & MASON, LTD., one of England's leading manufacturers of custom built furnaces, recently installed an interesting and unusual unit in one of their customer's London plants.

The furnace is designed for heat treatment of nickel based and stainless steel alloys, and the hardening and tempering of forgings in copper based alloys and aluminum bronze. It provides rapid and uniform heating to 1250 C. (2282 F.) followed by water quenching.

The plant consists of a car bottom furnace with the door mounted on and forming an integral part of the front end of the moving hearth (or bogie). The hearth is manually propelled along its track by means of a chain drive connected to one pair of the bogie wheels and is operated by a winding handle (Fig. 1). When out of the furnace, it comes to rest on a section of the track which comprises a tilting mechanism which is manually operated and counterbalanced.

On the left side of the track, at this point, is a water quench tank sunk into the floor and a metal ramp secured at bogie hearth level. As the complete hearth assembly is tilted by the mechanism, the charge on the hearth slides sideways and falls directly into the quench tank.

On the opposite side of the track is a loading table which is built at the same height as the hearth. This functions as an assist in loading, when the hearth has been restored to horizontal. The bogie can then be quickly and easily moved along the track to the furnace with minimum delay or heat loss. (Although the entire operation is manual, it is performed by one operator with only very moderate physical effort.)

The furnace comprises a fixed casing which has been strengthened to prevent distortion. The casing encloses the brickwork on all sides and is finished in heat resisting aluminum paint to reduce radiation.

The walls of the furnace consist of insulating refractory bricks, baked with diatomaceous insulation. The low thermal storage of this construction results in considerable fuel saving in a cyclic heat treatment operation of this character.

The advantage of using insulating refractory bricks lies in their quality for reflecting and non-retention of heat, resulting in considerable fuel saving and elimination of time necessary to reach operating temperature. The saving, in both instances, is approximately

FIG. 1. Bogie hearth is manually propelled along its track by means of a chain drive connected to one pair of the bogie wheels.

Note: All figures relating to gas consumption are based on gas having a calorific value of 500 B.th.U/cu. ft.

Acknowledgments: We are indebted to the North Thames Gas Board for permission to reproduce the photographs.

75% over that experienced when using ordinary firebrick.

Compactness of the unit is illustrated by the fact that the assembly can be accommodated in 222 sq. ft. of floor area and occupies approximately 1390 cu. ft. of space. The main dimensions are:

Overall working length	18 ft. 6 in.
Overall working width	11 ft. 10 in.
Overall height	6 ft. 2 in.

The internal furnace dimensions are:

Width at door opening	3 ft. 6 in.
Width between walls	4 ft. 3½ in.
Length from door to back of wall	4 ft. 10½ in.
Height from bogie hearth to crown of door arch	2 ft. 6½ in.

Heating is efficiently controlled by using two air blast multi-jet target type gas burners, each with a capacity of 1250 cu. ft. of gas per hour. The total consumption rating is 2500 cu. ft. of gas per hour. Each burner is fitted with eight nozzles. They are mounted vertically on the rear wall of the furnace, with one burner on each side.

The furnace and a 500 pound charge is heated to 2282 F. (1250 C.) in three hours, consuming 1700 cu. ft. of gas per hour. A subsequent charge of 500 pounds can be heated to 2282 F. in one hour, requiring 2500 cu. ft. of gas per hour. The flame, being short, does not impinge upon the charge and the hot gases, after circulating in the furnace chamber, are drawn through flues placed at bogie hearth level. They are exhausted through one damper controlled common outlet.

Gas is supplied from the mains to the burners through a double diaphragm governor and a back pressure valve.

Air is supplied by a blowing fan with a capacity of 200 c.f.m. at 22 in. water gauge, driven by a 1½ h.p. electric motor fitted at the rear of the furnace.

The furnace hearth is of the car bottom variety. It is built on a bogie running on track between the furnace and the quench tank or loading table. The bogie track is approximately 16 ft. 6 in. long extending from the back of the furnace to the quench tank or loading table. Overall, the bogie traverses a distance of 10 ft. 6 in. between operations.

To withdraw the hearth from the furnace, the operator turns the handle on the back of the door which is connected by a chain and bevel gear to the undercarriage of the bogie. The furnace door forms the back of the bogie. Like the sides of the furnace, it is reinforced to eliminate distortion. It is lined with diatomaceous material, insulating refractory and high quality firebrick. During firing, the door and the hearth are clamped in position by a simple but effective device fitted on both sides of the door.

FIG. 2. Bogie can be tilted to an angle of 30 degrees, discharging the load via a fixed sloping ramp at slightly below hearth level, into the quench tank.

The hearth has an insulating refractory lining surfaced with a high quality firebrick. Hot gases are prevented from escaping from the furnace chamber to the bogie undercarriage by sand seals. The sand seals consist of a dipper casting fixed to the furnace side walls below hearth level and a trough fitted on the rear wall of the furnace. The device is raised into position as the hearth enters the furnace by a roller and cam arrangement. The furnace door also serves as a heat shield for the operator both while manipulating the firing and prior to quenching. The hearth is 4 ft. 9 in. long and 3 ft. 3 in. wide with a capacity of 500 pounds of material.

The portion of track between the loading table and the quenching tank is built on a platform sunk into the floor. The platform is set on a semicircular cradle secured transversely to the track and seated on rollers below floor level in line with the track; the assembly being locked in position. This arrangement enables the operator, by simply unlocking the platform assembly and turning a handle, being connected by chain and sprocket to the platform, to tilt the bogie complete with undercarriage, platform hearth and load to an angle of 30 degrees. This discharges the load via a fixed sloping ramp at slightly below hearth level, into the quench tank (Fig. 2).

The quench tank is below floor level on the left side of the bogie, and is designed to accommodate a load of 500 pounds. Dimensions of the tank are 5 ft. by 3 ft. 6 in. by 4 ft. 6 in. deep. A perforated basket can be provided to facilitate ease of recovery of the quenched material. The estimated rise in temperature of the water in the quench tank on receiving the heated material is 140 F. Cooling is achieved by adding water from the water mains.

Concluded on page 40

HEAT TREATING PATENT DIGEST

Beginning with this issue METAL TREATING presents Heat Treating Patent Digest, a feature which will list patents granted for devices or processes which have particular interest in the metal treating field.

SINCE ITS INCEPTION the United States Patent Office has issued patents for almost every item or process now being manufactured or applied in this country. Following are a set of abstracts of such patents dealing with the areas of technology embraced in METAL TREATING which have been secured for publication. Readers should find these of interest.

Copies of complete specifications may be obtained from the Commissioner of Patents, Washington, 25, D. C. at 25¢ each.

Patent No. 2,997,567

D. Connelley; Ohio Crankshaft Company, August 22, 1961. A high frequency induction heating coil construction. A cylindrical lamination of separate flat magnetic laminations of a special construction is associated with the coil to provide a high stacking factor.

Patent No. 3,000,729

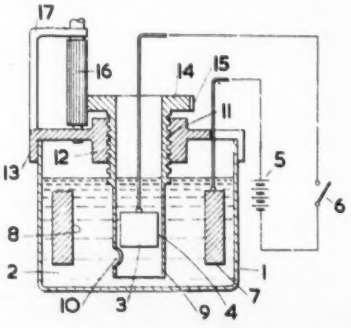
H. Tanezyn; Armco Steel Corp., September 19, 1961. A straight chromium stainless steel having quench-hardening properties and in which temper hardness can be closely controlled within required values while maintaining improved toughness and strength. In addition to iron, the composition contains up to 14% chromium and lesser amounts of carbon, manganese, phosphorus, sulfur, silicon, nickel, columbium, tantalum and vanadium.

Patent No. 3,000,730

H. Tanezyn; Armco Steel Corp., September 19, 1961. A quench hardenable free-machining stainless steel in which the response to tempering treatment is broadened. The ferrous composition is characterized by containing, in addition to up to 14% chromium, lesser amounts of carbon, manganese, silicon, nickel, vanadium, molybdenum, zirconium, either sulfur or selenium, and either columbium or tantalum.

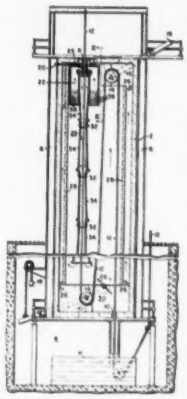
Patent No. 3,002,083

J. Lancaster; D. Milner and W. Hirst; The British Thomson-Houston Company Ltd., September 26, 1961. A process for the heat treatment of a metal object in an electrolytic bath. An insulating shield is placed between the object and the anode, leaving unshielded only that part of the object to be treated. When a sufficiently high voltage is caused to flow between the anode and unshielded area of the object, an electric discharge, which heats the area to a high temperature, is produced.



Patent No. 3,002,733

J. Barnes; Sunbeam Equipment Corp.; October 3, 1961. A heat treating furnace suitable for the treatment of a continuous ribbon or sheet of metal. The ribbon or sheet is conducted vertically through



a thin, wide heat exchange passage upon which is mounted a plenum chamber having inlet ducts and gas distribution means for producing a constant flow of heated gas through the entire width of the heat exchange passage.

Patent No. 3,002,865

W. Johnson; Associated Spring Corp.; October 3, 1961. A method of strengthening the surface of metallic springs by warm working. After the spring is formed to the desired shape, it is heat treated or cold worked to impart most of the properties of the metal from which it was formed. Finally, it is heated to a temperature just below the metal's softening temperature and, while in this state, is subjected to surface mechanical working so that no substantial change in shape or size is produced.

CARBURIZED CASE HARDENABILITY • • •

Concluded from page 14

for the .80-.90% carbon level. The position of the 60 Rockwell C line with .80 to .90% carbon on the carburized test bar is also expected to occur between the J-7 and J-8 position on the end quench test bar. Fig. 2 indicates that elements contributing to hardenability are lacking in Heat A. The lines also show that the effect of carbon substitution is limited and not sufficient to produce satisfactory results.

Heat B appears to be a borderline case. About 50% of gears from the pilot test met minimum specifications while the balance tested were slightly below requirements. A better understanding of the behavior of this heat during carburizing can be obtained by reviewing results in Fig. 3 obtained on the carburized hardenability bar. It should be observed that the positions of both 50 and 60 Rockwell C at the .90 carbon level fall short of the requirements for satisfactory production results. It is evident that the effect of hardenability of the addition of carbon is not sufficient to produce the desired case depth and nothing is gained by a longer carburizing time cycle. Thus, Heat B has a shallow case depth response to hardening. Both Heat A and B were rejected for applications to the pinion gear in question and applied to a smaller part.

Examined parts from pilot runs made from Heat C were found to be satisfactory, meeting the minimum case depth specifications. This is understood after examining the carburized case hardenability results obtained on the end quench bar and presented in Fig. 4. The chart definitely shows that when the optimum carbon is added along with the proper balance of alloy elements in the base steel, depth of hardness can be obtained through increased hardenability in the areas affected. The 60 and 50 Rockwell C points shift to a higher J position at the 0.80% carbon level in Fig. 4 when compared with Figs. 2 and 3. The results presented in these three figures were adequately supported by production carburizing results obtained on pinion gears examined from the pilot test runs. Carburizing and hardening information as presented on the Iso-Hardness diagram can be used to predict production case depth results on any part on a given heat. It is imperative, however, that suitable preparation be made to correlate the "J" position and carbon content for the critical areas on the part.

The futility of expecting increased case depth to be obtained by increasing the carbon addition through a longer carburizing time cycle is clearly shown upon examining the 50 Rockwell "C" line in Fig. 2 on Heat A. This particular point was verified at the gear and axle plant by carburizing a pinion gear from Heat A on a 16 hour carburizing cycle at 1700 F. The results were a slight increase of case depth at the pitch line, with no increase at the root line. (Pitch — .050 in. Root — .015 in.). The results on a gear carburized for 10 hours gave a case depth of 0.47 in. at the pitch line and .016 in. at the root line. The use of carburized hardenability results in conjunction with the pilot system can be used to avoid the economic loss of shipping, forging, machining, etc. of a heat of steel unsatisfactory for a specific application.

This procedure can determine specific carburizing application to a particular part before the heat leaves the mill. An important by-product is that it avoids controversial relations between suppliers and user.

• • •

"I TOOK THIS PART TO MY HEAT TREATER AND GUESS WHERE HE TOLD ME TO GO!"

About People.....

Leon B. Rosseau 1898-1961

Leon B. Rosseau, president and chairman of the board of Ajax Electric Company, passed away on September 15, 1961. He was 63 years old.

Mr. Rosseau became associated with the Ajax family of companies in July, 1940 when he joined Ajax as district sales manager. On December 18, 1957, he was elected president and chairman of the board. He held these positions until his death.

Mr. Rosseau was born in the United States but at an early age his family moved to France, where he received his primary education including his baccalaureate degree at the Sorbonne. He joined the United States Army and served in France during World War I. After World War I he returned to the United States and attended Cornell University, where he received his bachelor's degree in electrical engineering.

Mr. Rosseau was well known and respected as a specialist in the salt bath heat treating field. He had presented many papers over the years. Among the more recent was at the Fourth International Congress on Electro-Heat held at Stressa, Italy in May of 1959. His contributions in this field will be a memorial to him.

Surviving are his wife, two sons, mother and brother.

Ipsen Sales Expand

To meet the expanding industrial requirements in the southeast United States, Ispen Industries, Rockford, Illinois, now has sales representation in Atlanta, Georgia; Birmingham, Alabama; and Deerfield Beach, Florida. The distributors and personnel who will be responsible for the sales and service of Ipsen equipment include: Paul Crafton of the Consolidated Engineering Company of Atlanta, Henry Arnold of the Consolidated Engineering Company, Birmingham, and Don Jackson of the Don C. Jackson Company, Deerfield Beach, Florida.

Crafton, of the Atlanta office, will service the requirements of heat treat equipment users in North Carolina, South Carolina, Georgia and Eastern Tennessee. Arnold will represent Ipsen Industries in Alabama, Mississippi, Western Tennessee, and the Florida Panhandle. Jackson will serve central and southern Florida.

Wiegand Vice President

The appointment of Bruce A. Fleming, vice president in charge of sales at Edwin L. Wiegand Company, to executive vice president, has been announced.

Bruce A. Fleming

Fleming joined the company in 1940 as assistant to the president. He rose to the position of vice president and director in 1943 and has held that post up to the present time. During his career, he has become well known in the electric heating and appliance industries. Prior to 1940 he spent approximately 15 years in the appliance field.

Stanwood's Kansas Rep

R. A. Henry has been appointed to represent Stanwood Corporation throughout the state of Kansas.

Henry will present the company's complete line of baskets, fixtures, pots, retorts, muffles and furnace parts to firms in Kansas City, Wichita, Topeka and other industrial centers in the Sunflower State.

Ipsen General Manager

Charles W. Brunstetter has been appointed General Manager of Ipsen Industries, Inc.

Brunstetter joined Ipsen in September of 1960. He has been responsible for the development of the refractory metals division and served as manager of the division. Prior to joining the firm, he was vice president of Astrometals Corporation, Hawthorne, New Jersey.

In previous posts Brunstetter has carried out research and development projects with NASA in the use of refractory metals for space age requirements. He has also been associated with Thermionic Products Company of Plainfield, New Jersey.

Charles is a member of the American Society for Metals and has published articles concerning the properties of metals for space age requirements.

Promoted At Selas

Charles R. Wilt, Jr. has been appointed assistant chief engineer, Selas Corporation of America, Dresher, Pennsylvania.

Wilt joined Selas in May 1960 as assistant to the chief engineer, coming from Loftus Argentina Industrial Y Tecnica, South America, San Nichols, Argentina, where he served as resident engineer. Previously he was process furnace engineer for Reynolds Metals Company, Richmond, Virginia.

Harris Calorific Expands

In a move calculated to give the firm greater technological depth while permitting it to step up al-

ready accelerated research, design and development programs in several areas, Harris Calorific Company, Cleveland has appointed three men to its engineering staff.

Moving up to the chief industrial engineer post is Frank Hach,

Frank Hach, Jr.

Jr., a Case Institute graduate who joined Harris after almost 10 years with Lincoln Electric where he was a methods engineer. Prior to this Frank served in similar capacities at Pesco Products and Eculid Tool, both of Cleveland.

Al Burnell, formerly chief engineer of the K-G Division of Air

Al Burnell

Products, Inc., Allentown, was appointed product engineer. Al is a graduate of Stevens Institute of Technology, Hoboken, New Jersey.

Joseph J. Okladek

Also joining Harris as a product engineer is Joseph J. Okladek. Formerly a manager in the technical development department of Canadian Liquid Air, Joseph is a graduate of the Institut des Arts et Metiers, Brussels, Belgium.

GE Manager Named

Robert L. Aughenbaugh has been named manager of manufacturing for heat processing equipment at General Electric's industrial heating department.

Aughenbaugh joined General Electric in 1925 after receiving a BS degree in mechanical engineering from the University of Colorado. He spent his first 30 years with the company in Schenectady, New York, starting out on the manufacturing training program and working up to a supervisory level in various manufacturing operations.

In 1955, when the industrial heating department moved to Shelbyville, Aughenbaugh moved there as superintendent of heat processing equipment manufacturing. In 1957 he was named superintendent of

Robert L. Aughenbaugh

shop operations for the entire department. He became manager of manufacturing engineering of heat processing equipment in 1959.

Heads Kiln Division

Cary H. Stevenson, vice president of Lindberg Engineering Company, has announced the recent appointment of Elmer W. Edstrand as manager of Lindberg's kiln division.

Edstrand's divisional responsibilities will include charge of all sales of the company's line of kilns used throughout the ceramic, as well as other non-metallurgical industries.

Edstrand is a graduate of Illinois Institute of Technology, a registered professional engineer, and a member of The American Ceramic Society. He has had extensive experience with Lindberg during the past 13 years in the application of "Heat

Elmer W. Edstrand

for Industry" in both the metallurgical and the ceramic fields.

To Manage Honeywell's Brown Instrument Div.

The appointment of J. T. Pitts as sales manager of its Brown Instruments division has been an-

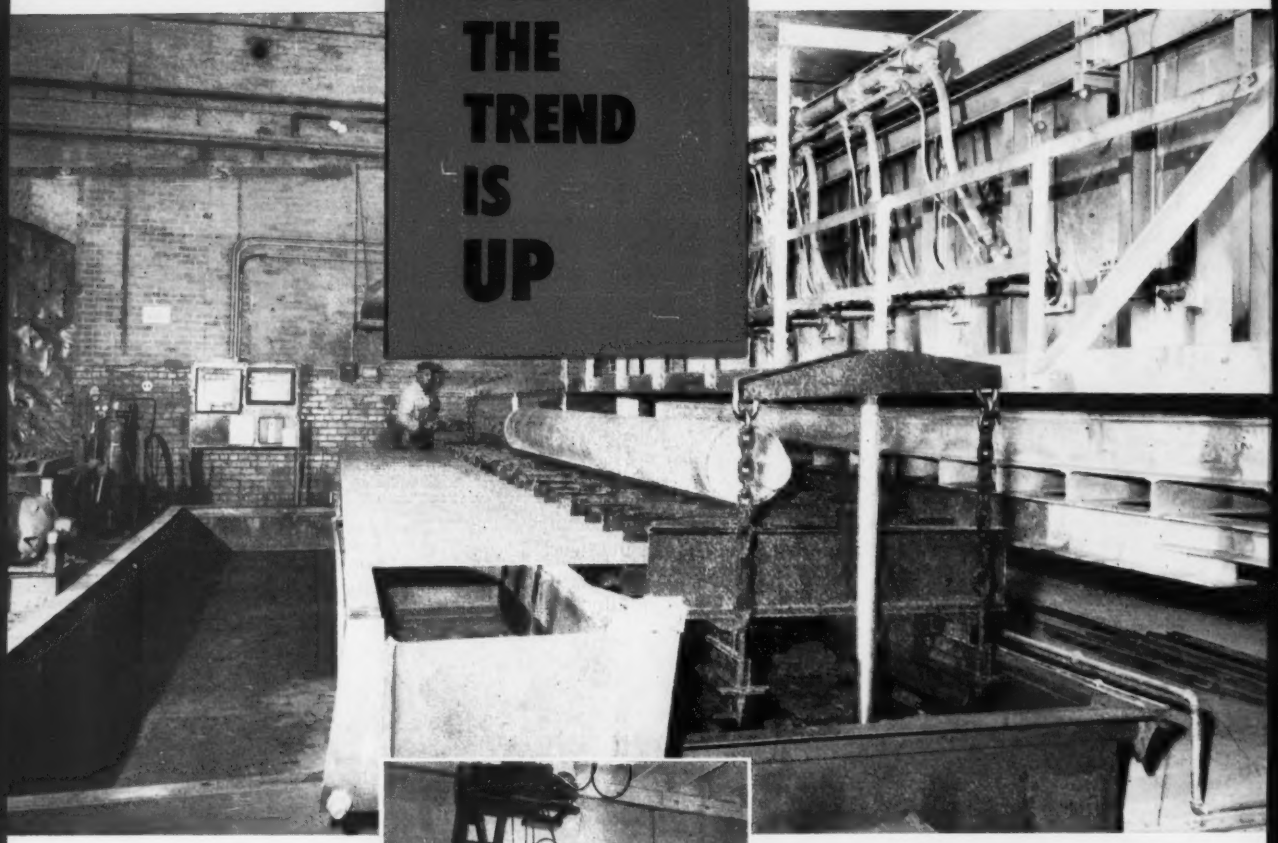
J. T. Pitts

nounced by Minneapolis-Honeywell Regulator Company.

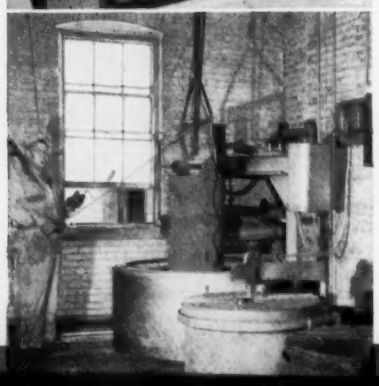
Pitts has held a variety of field sales management posts. He was Southwest regional manager with headquarters in Dallas with responsibility for all industrial, commercial, residential and home product sales in Texas, Oklahoma, Louisiana, Kansas as well as parts of Arkansas, New Mexico, Mississippi and Missouri.

Joining Honeywell in 1945, Pitts held sales posts in Charlotte and Durham, North Carolina before going to Houston, where he was branch manager from 1952 to 1958.

TODAY THE TREND IS UP



Modern specifications call for better properties achieved by better heat treating —check with your commercial heat treater



Whenever a modern product is improved or a new one developed it has now reached a point where the heat treating procedures and processes to be applied to basic component parts are among the original factors to be considered. In the past, fabricating methods and metals were frequently the first to be specified and heat treating, if involved at all, was a secondary problem.

Because of this and because of the new and exceptional design characteristics and ultimate engineering properties which can be achieved only through skillful and accurate heat treating, the tonnage volume of heat treating materials processed by the commercial heat treating industry grows steadily month after month.

There is another reason for this and it is found in the fact that only the commercial heat treater offers practically an all inclusive diversity of plant facilities, but even more important, the accumulation of technical skills, experienced personnel, and the background of knowledge so essential to this field.

If you would like to receive a charted monthly report of the volume of activity in this industry, write us on your company letterhead. We will be glad to send it to you.

Whatever your heat treating problem, always check with your commercial heat treater first.

THERE'S A HEAT TREATING SPECIALIST NEAR YOUR PLANT

ALABAMA

Southern Metal Treating Co., Inc.
3131 10th Ave. N., Birmingham 4

CALIFORNIA

Downey Steel Treating Co., Inc.
9637 Nance St., Downey
Columbia Industries, Inc.
6057 State St., Huntington Park
National Heat Treating Co., Inc.
1833 W. Florence, Inglewood 1
Certified Steel Treating Co.
2454 E. 58th St., Los Angeles 58
Lindberg Steel Treating Co.
2910 S. Sunol Drive, Los Angeles 23
Cook Induction Heating Co.
4925 East Slauson Ave., Maywood

CONNECTICUT

Commercial Metal Treating, Inc.
89 Island Brook Ave., Bridgeport 6
Stanley P. Rockwell Co.
296 Homestead Ave., Hartford 12
Ireland Heat Treating Co.
512 Boston Post Road, Orange

FLORIDA

Rex of Florida, Inc.
1881 S.W. 36th St., Fort Lauderdale

ILLINOIS

Accurate Steel Treating Co.
2226 W. Hubbard St., Chicago 12
Allied Metal Treating Corp. of Illinois
333 N. California Ave., Chicago 12
Dura-Hard Steel Treating Co.
2112 W. Rice Street, Chicago 22
Perfection Tool & Metal Heat Treating Co.
1756 West Hubbard St., Chicago 22
Fred A. Snow Co.
1942 West Kinzie St., Chicago 22
American Steel Treating Co.
P. O. Box 396, Crystal Lake
Lindberg Steel Treating Co.
1975 N. Ruby St., Melrose Park
Eklund Metal Treating, Inc.
721 Beacon St., Rockford
Ipsenlab of Rockford, Inc.
2125 Kishwaukee Street, Rockford
O. T. Muehlemeyer Heat Treating Co.
1500 Preston St., Rockford
Scott Ford, Inc.
2719 Fifth St., Rock Island

INDIANA

Quality Steel Treating Company
3860 Prospect St., Indianapolis
Industrial Heat Treating & Metallurgical Co., Inc.
2131 Northwestern Ave., Indianapolis 2

MASSACHUSETTS

Kinetics Corporation, a Division of High Vacuum Equipment Corp.
2 Churchill Road, Hingham
Porter Forge & Furnace, Inc.
74 Foley St., Somerville 43

MASSACHUSETTS — (Cont'd)

New England Metallurgical Corp.
475 Dorchester Ave., South Boston 27
Springfield Heat Treating Corp.
99 Margaret Street, Springfield
Greenman Steel Treating Co.
284 Grove St., Worcester 5

MICHIGAN

Anderson Steel Treating Co.
1033 Mt. Elliot Avenue, Detroit 7
Bosworth Steel Treating Co.
18174 West Chicago Blvd., Detroit 28
Commercial Steel Treating Corp.
6100 Tireman Ave., Detroit 4
Commonwealth Industries, Inc.
5922 Commonwealth Ave., Detroit 8
Vincent Steel Process
2424 Bellevue Ave., Detroit 7
State Heat Treat, Inc.
520 32nd Street, S. E., Grand Rapids 8
Royal Oak Heat Treat, Inc.
21419 Dequindre, Hazel Park
Vac-Hyd Processing Corp.
116 Manchester, Highland Park 3

MISSOURI

Lindberg Steel Treating Co.
650 East Taylor Ave., St. Louis 15
Paulo Products Co.
5711 West Park Ave., St. Louis 10

NEW JERSEY

Fred Heinzelman & Sons, Inc.
790 Washington Avenue, Carlstadt
American Metal Treatment Co.
Spring and Lafayette Sts., Elizabeth
Benedict-Miller, Inc.
Marin Ave. & Orient Way, Lyndhurst
Bennett Heat Treating Co., Inc.
246 Raymond Boulevard, Newark 5
L-R Metal Treating Corp.
107 Vesey St., Newark 5
Temperature Processing Co., Inc.
228 River Road, North Arlington

NEW YORK

Owego Heat Treat, Inc.
Rural Route 1, Apalachin
Eastern Heat Treating & Brazing Corp.
44 Sea Cliff Avenue, Glen Cove
Alfred Heller Heat Treating Co., Inc.
391 Pearl St., New York 38
Lindberg Steel Treating Co.
620 Buffalo Road, Rochester 11
Rochester Steel Treating Works
962 Main Street, E. Rochester 5
Syracuse Heat Treating Corp.
1223 Burnet Ave., Syracuse 3

OHIO

Queen City Steel Treating Co.
2980 Spring Grove Ave., Cincinnati 11
Ferrotherm Co.
1861 E. 65th St., Cleveland 3
Lakeside Steel Improvement Co.
5418 Lakeside Ave., Cleveland 14

OHIO — (Cont'd)

George H. Porter Steel Treating Co.
1273 East 55th Street, Cleveland 3
Reliable Metallurgical Service, Inc.
3827 Lakeside Ave., Cleveland 14
Winton Heat Treating Co.
20003 Lake Road, Cleveland 16
Dayton Forging & Heat Treating Co.
2323 East First St., Dayton 3
Ohio Heat Treating Co.
1100 East Third St., Dayton 2

PENNSYLVANIA

Drever Company
Red Lion Rd. & Philmont Ave., Bethayres
Robert Wooler Company
Dresher
Wiedemann Machine Co.
Gulph Road, King of Prussia
J. W. Rex Co.
Eighth and Franconia Avenue, Lansdale
Lorenz & Son
1351 N. Front St., Philadelphia 22
Metlab Company
1000 E. Mermaid Lane, Philadelphia 18
Pittsburgh Commercial Heat Treating Co.
49th St., and A.V.R.R., Pittsburgh 1

TENNESSEE

Mid-South Metal Treating Co.
463 Scott St., Memphis 12

TEXAS

Dominy Heat Treating Corp.
P. O. Box 5054, Dallas
Superior Heat Treating Co., Inc.
P. O. Box 69, Fort Worth 1
United Heat Treating Company
2005 Montgomery Street, Fort Worth 7
Cook Heat Treating Co., of Texas
6233 Navigation Boulevard, Houston 11
Houston Heat Treating Company, Inc.
2100 Quitman Street, Houston 26
Lone Star Heat Treating Corp.
5212 Clinton Dr., Houston 20

WISCONSIN

Allied Metal Treating Corp.
P. O. Box 612, Milwaukee 1
Heat Treating Engineers, Inc.
1146 North 54th St., Milwaukee 8
Metal Treating, Inc.
720 South 16th St., Milwaukee 4
Supreme Metal Treating Co.
4440 West Mitchell St., Milwaukee 14
Thurner Heat Treating Co.
809 West National Ave., Milwaukee 4
Wisconsin Steel Treating & Blasting Co.
1114 South 41st Street, Milwaukee 15
Harris Metals, Inc.
4210 Douglas Ave., Racine

All of the above listed firms are members of the

METAL TREATING INSTITUTE

Box 448, Rye, New York

For further information circle No. 15

WHAT WOULD YOU DO?

a problem in labor arbitration taken from the files of the American Arbitration Association

CASE OF THE INTERVENING HOLIDAY

"The company may, in case of a shutdown of no more than two days' duration, lay off employees without regard to seniority."

That's what the contract read at a garden tools manufacturing company. It seemed clear enough until management decided to shut down a single operation for two days, November 23 and 25, 1960. The 24th was Thanksgiving Day, and the whole plant was closed anyway, with employees paid for the holiday.

To the company, this plan was a two day layoff, permitting seniority to be disregarded. But one of the employees affected thought differently. "I was really out three days," he said. "The fact that I was paid for one of those days doesn't make any difference. It amounted to a layoff of more than two days so you should have recognized my seniority and laid off a junior man."

"On the contrary," answered the plant superintendent. "A paid holiday is the same as a day worked, as far as the contract is concerned. We compute it that way in determining vacation and overtime pay. So why should absence on a holiday be regarded as a day on layoff?"

The matter couldn't be disposed of in grievance procedure and finally went to an arbitrator under the rules of the American Arbitration Association.

THE AWARD. The arbitrator said: "The answer must be found in the purpose of the quoted clause. That purpose was, upon its face, to give the company two clear days of temporary inactivity within a department without the adjustments that seniority entails. To count a paid holiday, when the entire plant is inactive, as one of those two days appears to me to thwart the object of the paragraph."

CASE OF THE BYPASSED SWEEPER

In preparation for a visit from an important customer the management at a metal cabinet company decided a certain department needed a thorough cleaning. The foreman estimated that the whole job could be done in eight hours by someone who could operate the fork lift for one hour and sweep up rubbish the rest of the time. So a fork lift operator was called in for overtime on a Saturday.

That led to a grievance by the regular sweeper who thought he should have been awarded the day's work. He cited a contract clause that read: "Insofar as is practicable, overtime will be distributed by the company equally among employees performing the same or similar operations."

"You aren't qualified to operate the fork lift," the foreman answered. "It wouldn't have been practical to call in two men when there was work enough for only one."

Eventually the case went to arbitration under the rules of the American Arbitration Association.

THE AWARD. The arbitrator said it might have been wasteful to call in both the sweeper and the fork lift operator, but that didn't mean it wasn't practical. The parties had negotiated an overtime provision which, in some situations, results in waste of money, he said, but he reminded them that all he could do was interpret their agreement, not alter it. The grievance was sustained.

Here's Proof that Park AAA Gives QUICK-QUENCHING Action!

Inspecting the dramatic action of Park Chemcal's AAA quench oil are (l. to r.): Harold F. Wagner, Service Metallurgist, Commercial Steel Treating Corp.; Wm. Askew, from Park's Detroit office; Anthony J. Beck, Chief Engineer, Commercial Steel Treating Co.; and Merle Hoensheid, Plant Manager, Commercial Steel Treating Corp.

Here you see the dramatic action of Park Chemical Company's AAA Quench Oil, a faster cooling yet extremely long-lasting quench oil. Park AAA provides higher and more uniform hardness, with little or no distortion, warping, or cracking. To quote Merle Hoensheid, General Manager of the Stephenson Highway plant of the Commercial Steel Treating Corporation, Detroit: "We have learned to *depend* on the more than satisfactory results from Park's AAA quenching oil."

Park Chemical produces a complete line of heat treating materials bearing the same high quality and dependability of Park's AAA. Highest quality and uniformity are absolutely maintained in *all* Park heat treating products through strict laboratory control from raw material to finished product.

We would be happy to help you work out a solution to your heat treating problems without obligation. Call or write today.

Woodside Rapid Carburizers (Non-Burning—Charcoal-Coke-Specification) • Park-Kase Liquid Carburizers • Quenching and Tempering Oils • Cyanide Mixtures • Neutral Salt Baths • High Speed Steel Hardening Salts • Iso-Thermal Quenching and Tempering Salts • Protective Coatings (No-Carb—No-Kase—No-Scale—No-Tride) • Carbon Products (Charcoal-Crushed Coke-Pitch Coke-Lead Pot Carbon) • Kold Grip Polishing Wheel Cement • Par-Kem Metal Cleaners • Cutting and Grinding Compounds (Kem-Cut—Kem-Grind—Blue Ice)

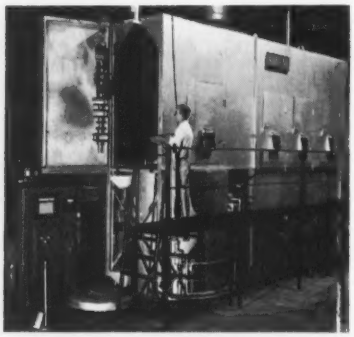
Park **PARK CHEMICAL COMPANY** • **8074 Military Ave. Detroit 4, Mich.**

For further information circle No. 16

NEWS TO HEAT TREATERS...

J. W. Rex Company Installs Tufftriding

J. W. Rex Company, Landsdale, Pennsylvania, has completed the installation of a newly developed heat treating process known as Tufftriding.



Introduced in this country by Kolene Corporation, Detroit, under license from the inventors, Degussa-Durferrit, West Germany, the method provides an additional and unusual service to manufacturers in that it furnishes designers and engineers a means of combining increased surface hardness with a greater wear resistance, toughness and fatigue strength.

J. W. Rex is the only commercial heat treater in Pennsylvania offering this process.

For further information circle No. 19

Cincinnati Milling's 5 KW RF Induction

This Cincinnati 5 KW RF Inductron is a bench type induction heating machine suitable for hardening, annealing, drawing, normalizing, stress relieving, soldering, brazing, shrink fitting, bombarding, and similar industrial heat processing applications on either a small-lot or high production basis. The unit, which is produced by Cincinnati Milling Machine Company, is self contained, compact, and easy to move to provide a high degree of mobility. It can be placed directly in production lines to reduce work handling. Among the useful extras available are dual heating stations and an independent electronic control to permit different heat levels to be employed at each station.

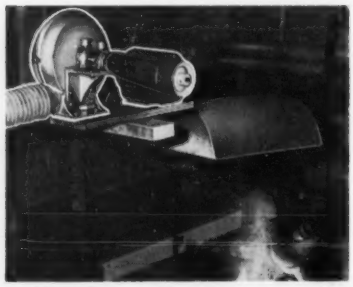
A similar unit is available in one KW capacity.

For further information circle No. 20

Fume Exhaust System

A small compact unit for removing fumes and smoke at the source is available from Belsaw Machinery Company, Kansas City, Missouri.

The Belsaw 922 Blower can be used for collecting metal and wood shavings and for shop cleaning. It



comes complete with 10 in. blower, ¼ HP electric motor and 3 in. flexible hose.

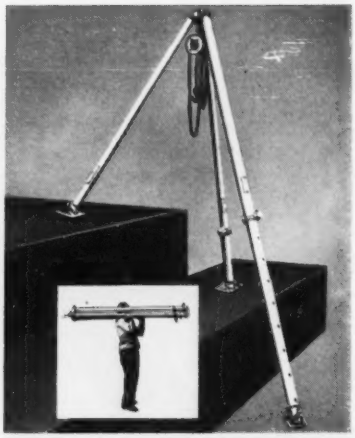
Model 922 weighs 45 pounds and is being sold on a 30 day shop trial.

For further information circle No. 21

Adjustable "Skyhook"

A low cost alternate for expensive rigging equipment is available from B. E. Wallace Products Corp., Exton, Pennsylvania. Called Magic-Pole Adjustable Tripod, it handles many of the jobs that often tie up overhead cranes. Installing pumps and engines, raising heavy equipment for repairs, and loading trucks and dollies are just a few of its many uses.

This versatile hoist support has three telescoping legs with up to six ft. of height adjustment. Each leg can be raised and lowered



separately, as well as positioned in any angle, and even set on different levels without "sawing off" or "digging in." The device is especially suited for buildings whose ceiling strength is inadequate for elaborate monorail systems.

For further information circle No. 22

Versatile Basket

A versatile work basket that may be used singly or in combinations for heat treating applications has been designed by Wiretex Manufacturing Company, Bridgeport, Connecticut.

Made of ⅛ in. sheet type 330 alloy, the basket is corrugated for greater strength and more even distribution of heat. The fixture is 25⅛ in. in diameter and 13⅛ in. deep. Designed primarily for pit type furnaces, a single basket is capable of holding a load of up to 2,000 pounds. For added strength, baskets

have an outside top ring of 1½ in. by ¼ in. flat bar and a bottom outside ring of 1½ in. by 1½ in. by 3/16 in. angle. Parts holding grid is ½ in. diameter rod on 2 in. centers.

For further information circle No. 23

Lindberg Announces New Hyen Generator

Lindberg Engineering Company has announced its new Hyen endothermic generator. The unit is a fully automatic process for producing low cost protective atmosphere for bright hardening, bright annealing or bright brazing of steel, totally free of decarburization or carburization.

The generator is available in 200, 500, 750, 1,000 and 1,500 c.f.h. sizes and is also obtainable in larger sizes.

The compact unit contains its own instrument panel and is fully piped and wired to save installation costs.

For further information circle No. 24

Conveyor Quench Tank

The Cincinnati conveyor type quench tank shown here is one of a series of basket type and conveyor type quench tank units available for use with their new standard "building block" flamatic and inductron heating units.

This unit is completely self contained and includes automatic agitation and circulation of the quench medium, a heat exchanger, and a motor driven conveyor to remove the parts from the quenching medium.

For further information circle No. 25

Front Panel Control

A new series of indicating temperature controllers featuring front panel control setting and an easy-to-read, servo-controlled indicating dial has been introduced by Electronic Processing Corp., San Francisco.

Front access to all elements is made possible by unlocking the new, hinged front. Maintenance and parts replacement is also simplified with the exclusive EPC circuit plug-ins, epoxy-encapsuled to withstand moisture, dust, vibration and environmental changes.

The 6000-A series utilizes a precision Wheatstone bridge circuit with a choice of four control modes covering the complete range of temperature control sophistication from on-off through proportional and 3-position operation. A fail-safe resistance sensing element is used with the controller. Temperature ranges from -300 to 2000 F. are available.

For further information circle No. 26

Compact Generator

A new industrial gas generator guaranteed to maintain 99.99% dissociation efficiency, with 200 c.f.h. capacity and requiring only 15 in. square floor space, has been announced by Lindberg Engineering Company, Chicago. The manufacturer reports that this combination of efficiency, capacity and compactness sets a new standard in industrial generator design.

New developments incorporated in the generator are the use of a tubular Inconel free flow retort, permanent nickel type catalyst, and long life 80-20 alloy heating elements fully supported and com-

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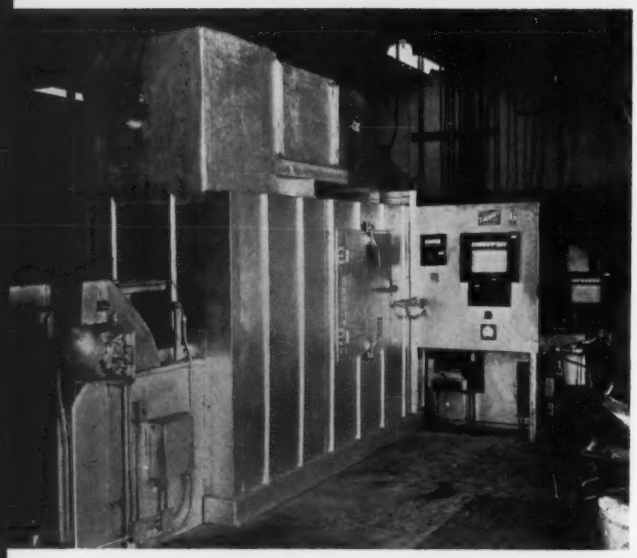


The new automatic conveyor-type heat furnace installed at the Cherry Rivet Division of Townsend Company in Santa Ana, California, features automatic loading and discharge, making full time operator attendance unnecessary.

AUTOMATIC LOADING AND DISCHARGE SAVES DOLLARS AT TOWNSEND

A NEW AUTOMATIC conveyor type heat treat furnace recently installed at Cherry Rivet Division of Townsend Company in Santa Ana, California has produced savings of more than $15,000. in one year of operation.

Many economies not originally foreseen have been achieved by the new furnace. Quality has been so consistent that inspection time, scrap, rework and physical labor have been reduced to a minimum. Increased capacity has allowed production to handle peak loads and improve delivery schedules.

Designed to Cherry Rivet specifications, the new furnace features an automatic loading mechanism, dispersion of parts for treatment onto a wide conveyor, constant temperature at each cycle stage, control of conveyor speed and timing cycle, rapid quench for retention of original metal structure and automatic discharge. The unit handles 1,000 pounds of material per hour at specified temperatures, with a maximum controlled temperature of 1000 F.

Heat Treating

Case Histories

— Case No. 9

Precise temperature control is achieved by use of a saturable core reactor which gives infinite control over power input. Furnaces of this type usually have 100% on-off control, but the saturable core reactor varies the amount of current input, providing a very narrow margin between the highs and lows of air temperature as it is fed into the furnace. This reactor and careful placement of control thermocouples allows closer than plus or minus five degree control variation.

The type of aluminum being heat treated in the Cherry Rivet furnace requires that the material be heated to its highest temperature, then immediately quenched. This procedure does not allow for any fall off in temperature, even as the work load is going off the curved exit portion of the belt. Temperature control and rapid quenching are two major features in the prevention of susceptibility to intergranular corrosion.

By using a relatively wide belt conveyor at slow speeds, the furnace trickles the work load into quench water a few pieces at a time. This is in contrast to the usual method of immersing a large bulk of parts into the water at one time, a procedure where outer pieces obtain better quenching than parts in the center. Controlled, even quench gives a high degree of uniformity in such physical properties as tensile and shear. Parts are dropped from the end of the conveyor into quench water at a distance of approximately two ft. This establishes a quench time of a fraction of a second rather than two to three seconds optimum in pit type furnaces.

Automatic loading and discharge are features of the new furnace, making it unnecessary for an operator to be in constant attendance. This also provides for adequate time spacing and separation of certified lots.

A box holding rivets is tilted into position by a controlled chain drive. Rivets fall into a hopper and spread to a conveyor running at a pre-set speed. The empty box is replaced with a full one. After rivets from the preceding box have left the hopper and none make contact with the roller for five minutes, a new box is automatically tipped.

As each separator strip segmentizing the conveyor trips a limit switch, a solenoid is engaged. This opens the hopper gate and lets accumulated rivets drop into its own automatically positioned box. If no rivets fall into the hopper for a previously set time limit the circuit remains open and the box-stop tilts to let the filled box roll away. The next empty box then rolls into position under the hopper.

Time and labor saving advantages of the new Cherry furnace are apparent when compared with the attention an operator must pay to a smaller single purpose furnace in the same area. These units still provide ample capacity for annealing, tempering, drawing and heat treating for small lots of special rivets and tools. However, the completely automatic conveyor type furnace eliminates most of the problems of manual control and provides a constant matching production for fluctuating delivery load problems. ● ● ●

U-shaped GLOBAR® elements used in unique vacuum brazing furnace

Brazing of stainless steel honeycomb aircraft and missile structures is handled at Grumman Aircraft Engineering Corp. by a unique vacuum furnace, manufactured by F. J. Stokes Corporation. The new equipment eliminates the need for enclosing the work in an air-tight metal envelope, saves better than $40,000 a month in the cost of argon gas previously needed for inert-atmosphere brazing and results in work with enhanced physical properties.

The success of the unit depends in large part on the flexibility of furnace design made possible by GLOBAR silicon carbide electric heating elements. The photo above shows the under side of the upper heating frame, with its 60 specially designed U-shaped GLOBAR elements. This is hydraulically lowered on a bed frame, similarly equipped with 60 additional GLOBAR units. The work is sandwiched between the frames. Sealing the two sections provides the furnace chamber, which is evacuated to a pressure of less than 0.5 microns.

Controls provide 10 transverse heat zones throughout the 6′ x 10′ length of the furnace. Temperature is precisely regulated during the various cycles of soaking, brazing, cooling and re-heating to produce the desired physical properties. Brazing temperature is 1640° F. Development of this unique furnace opens a wide field of possible applications in handling difficult brazing and heat-treating problems. It also emphasizes the unusual potentialities of electric heating with GLOBAR elements. Why not investigate their advantages for your particular job? Consult your furnace builder or write to Refractories Div., Globar Plant, Dept. MT - 121, Carborundum Co., Niagara Falls, N. Y.

For precise, economical electric heating

GLOBAR silicon carbide heating elements

- Standard straight-type elements shipped from stock or within two weeks.
- Temperatures from 1400 to 2800 F, precisely controlled, independent of atmosphere.
- Regular elements used in most furnaces are easily replaced from outside without waiting for furnace to cool.
- "On line" operation for many applications—no transformer necessary.
- Type AT elements 4" to 105" in length.
- For greater economy in heat treating, brazing, forging, melting and sintering.

CARBORUNDUM®

For further information circle No. 2

NEWS TO HEAT TREATERS

Continued from page 29

pletely encircling the retort. The use of refractory and slab type insulation reduces heat loss and maintains an unusually high thermal efficiency.

For further information circle No. 27

New Warwick Home

The Warwick Industrial Furnace and Engineering Corp. has moved to their newly constructed building located at 9219 Park Avenue, Franklin Park, Illinois.

Warwick, headed by O. H. Warwick, Jr., president, designs and builds non-ferrous melting furnaces of all types and kinds. Their engineering services include complete plant layout and melting room procedures for foundries, die cast and permanent mold operations.

Convenience for customer visits is provided by the location being 10 minutes from O'Hare International Airport and expressway exits.

For further information circle No. 30

Moon Rocket Furnace Completed by J. W. Rex

Under construction for over a year, the world's largest heat treating furnace, designed for treating components of giant rockets or missiles, is now completed at the plant of the J. W. Rex Company, Landsdale, Pennsylvania. Capacity of the furnace is such that parts for the

recently designed NOVA moon rocket could be readily handled.

This is the third furnace of this type to be designed, engineered and installed by the company and makes it the largest facility of its kind in the country.

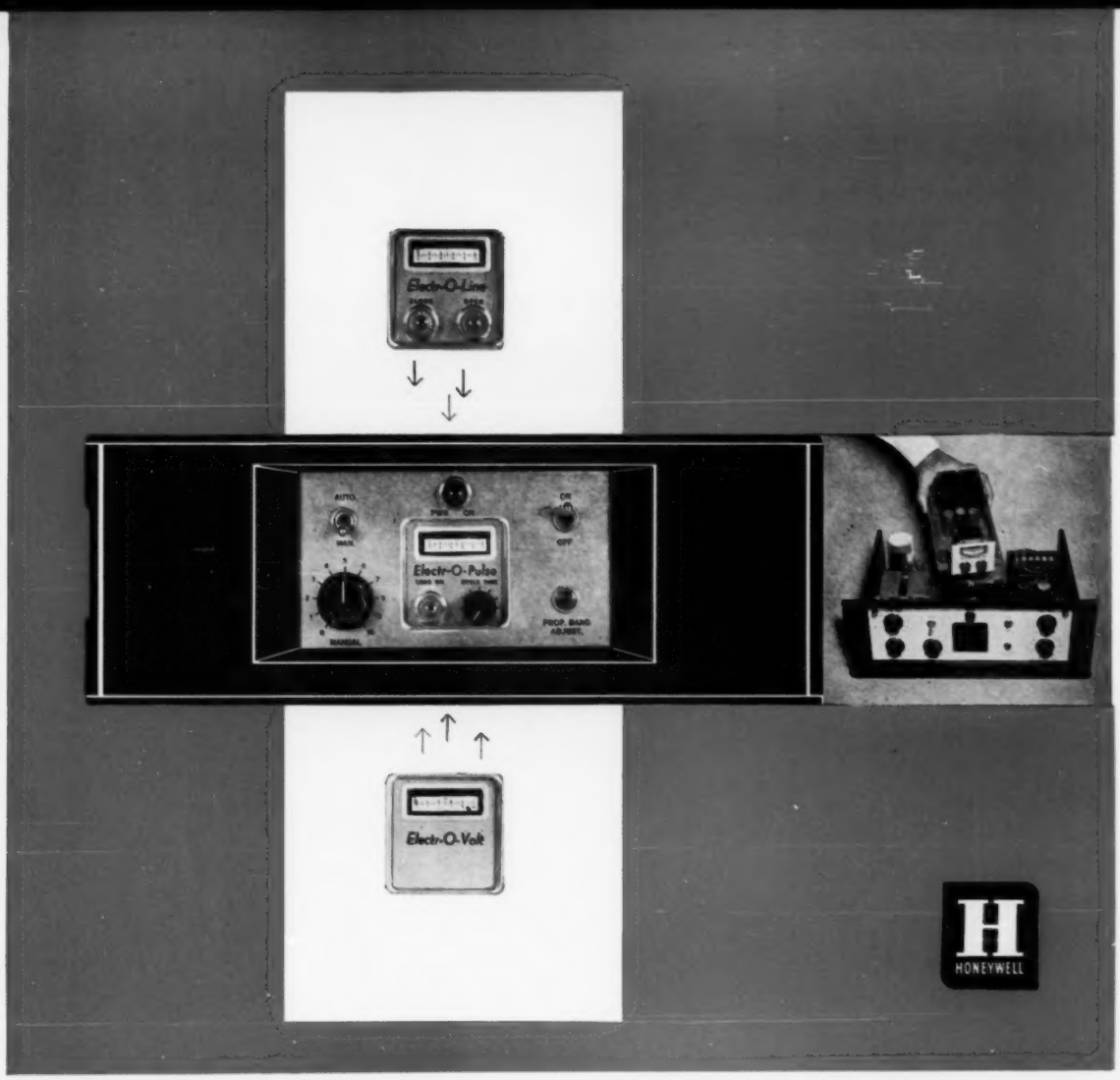
For further information circle No. 31

A New England First

The installation of completely automatic vacuum heat treating and brazing equipment at Commercial Metal Treating, Inc., has been announced by Michael Kober, president. This is New England's first integration of such furnace equipment with the facilities of a commercial, general heat treating shop.

Vacuum processing makes it possible to harden and anneal stainless steels, high speed steels, tool steels, and high temperature alloys without danger of surface contamination or discoloration. It can also

Continued on page 34



Three ways to get peak performance from your furnaces!

1. Electr-O-Line Control Unit for position-proportioning control with reset and rate action.
2. Electr-O-Pulse Control Unit for time proportioning control with reset and rate action.
3. Electr-O-Volt Control Unit for current-proportioning control with reset and rate action.

These new Honeywell three-mode control units can actually improve the performance of your furnaces by providing the exact temperature that's needed. They include features that cannot be matched: Smooth three-mode control with extra-wide band adjustments. You can adjust the proportional band up to 500%; reset action from 0 to 100 repeats per minute; and rate time from 0 to 10 minutes. "Auto-man" switching is bumpless.

Modular construction with interchangeable control output sections. Modular plug-in construction is used throughout. Amplifier and power supply sections are the same for all three units.

For more complete details on these and other types of furnace controls, contact your nearby Honeywell field engineer. Minneapolis-Honeywell, Wayne and Windrim Aves., Phila. 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ont.

Honeywell

H First in Control SINCE 1885

HONEYWELL INTERNATIONAL Sales and Service offices in principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

For further information circle No. 34

NEWS TO HEAT TREATERS

Continued from page 32

be used for sintering and brazing of high temperature alloys. Extensive instrumentation permits extreme quality control and automatic, accurate programing of heating and cooling rates and cycles.

The vacuum furnace installed at Commercial has an effective work area 22 in. wide by 34 in. long by 12 in. high. It is designed to maintain continuous operating temperatures up to 2250 F. at an ultimate pressure of 0.1 micron.

For further information circle No. 32

Testing Lab Moves

Another New England corporation, the Arnold Greene Testing Laboratories, Inc., has moved into their new plant at Cerel-Perini's East Natick Industrial Park, Natick, Massachusetts.

The firm, which was formerly located in Cambridge. is engaged in the field of inspection, testing and consulting for commercial enterprises.

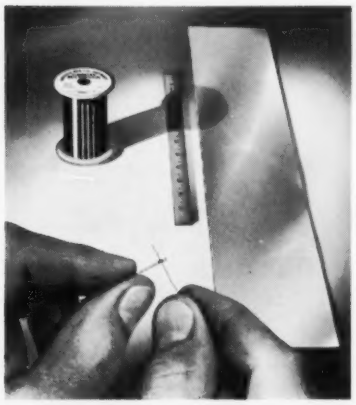
Founded 12 years ago by Arnold Greene, president and treasurer, the company has grown from a three man operation to a business now employing over 40 highly trained engi-

neers, technicians and executive personnel. By next year, this figure is expected to be increased to 60.

For further information circle No. 29

Tungsten-Rhenium Range Expanded

Development of new, improved metallurgical processing techniques which permit production of ultra high temperature tungsten-rhenium refractory metal alloys in an expanded range of wire and strip sizes have been announced by Hoskins Mfg. Company.



The company has been producing tungsten-rhenium alloys in commercial quantities since June, 1960, for use in space vehicles, nuclear reactors and many advanced electronic, thermoelectric, industrial heating and structural applications.

Due to inherent characteristics of the two refractory metals and the problems encountered in converting them from powder into useful homogeneous alloy forms, initial production was confined to a limited range of sizes.

Since installation of special equipment required for its new processing methods, however, Hoskins has produced a tungsten-26% rhenium alloy in wire sizes as fine as .0005 in. diameter and in continuous lengths of over 2000 ft. Short lengths of strip of the same composition have also been produced by the new process in widths up to four in. and in thicknesses down to .005 in.

For further information circle No. 75

Far East First

The first high production furnace for continuous bright annealing of stainless steel strip in the Far East will be installed by International General Electric at Takasago Iron Works in metropolitan Tokyo.

The vertical tower furnace, rated 660 kilowatts with a furnace temperature of 2100 F., will be capable of processing 4500 pounds per hour of 15 to 31 in. strip.

International General Electric, the overseas marketing organization for the General Electric Company, will furnish controls for the line, and will sub-contract the terminal equipment.

IGE also will be prime contractor for a 52 in. stainless steel bright annealing line for the Nanyo works of the Nishin Steel Works, Ltd., in Tokuyama, Japan. The furnace, rated 1100 kilowatts, will have a capacity of 9000 pounds per hour.

For further information circle No. 76

Space Age Alloys

In a step designed to meet the requirements of the Space Age and to face the exacting challenge of a growing demand in the heat treating industry, Rolled Alloys, Inc., Detroit, has increased capacity at its three alloy service centers in Detroit, South River, New Jersey and Los Angeles to where the firm maintains an inventory of one and one half million pounds of finished sizes of its complete line. In addition, the company carries almost one million pounds of ingots and billets in process, supporting its inventory and providing flexibility so an item or a non-stock size can be scheduled.

Rolled Alloys has also recently developed a special purpose alloy called RA-333 for use in a broad temperature range. In tests, this alloy withstood use successfully for an expanded metal tray which conveys parts through a copper brazing furnace at 2025 F.

Continued on next page

NEWS TO HEAT TREATERS

Continued from preceding page

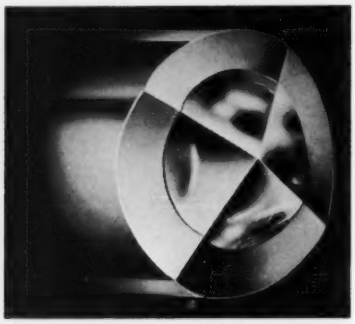
It is reported to have many additional uses and has been adapted as circulating fans used in carburizing and carbonitriding furnaces, muffles, and shaker hearths.

For further information circle No. 77

Hardness Indentor

A high temperature testing indentor specified to meet the demand for an instrument where heat conditions may be as high as 3000 F. has been developed by F. F. Gillmore Company, Boston.

A specially developed sapphire solidly mounted in a molybdenum shank are the basic components of this unit. It comes in two basic



shapes, sphero-conical and pyramidal, with the pyramidal model incorporating the standard Vickers 136 degree angle. The indentors are manufactured with jewels mounted in a wide variety of shanks for use in all standard testing machines. They are also made to suit special requirements.

For further information circle No. 40

Choice of Quenches Offered By Lindberg

A tube type furnace, manually operated, for heat treating of metals which offers a choice of quenches is available from Lindberg Engineering Company.

One prime feature of the unit is a choice of quenches. A chute between the heat chamber and the cooling jacket permits either an oil quench or atmosphere cooling, whichever is required.

Automatic flame curtains at the entry or charging door, as well as at the discharge door, prevent the infiltration of air into the muffle.

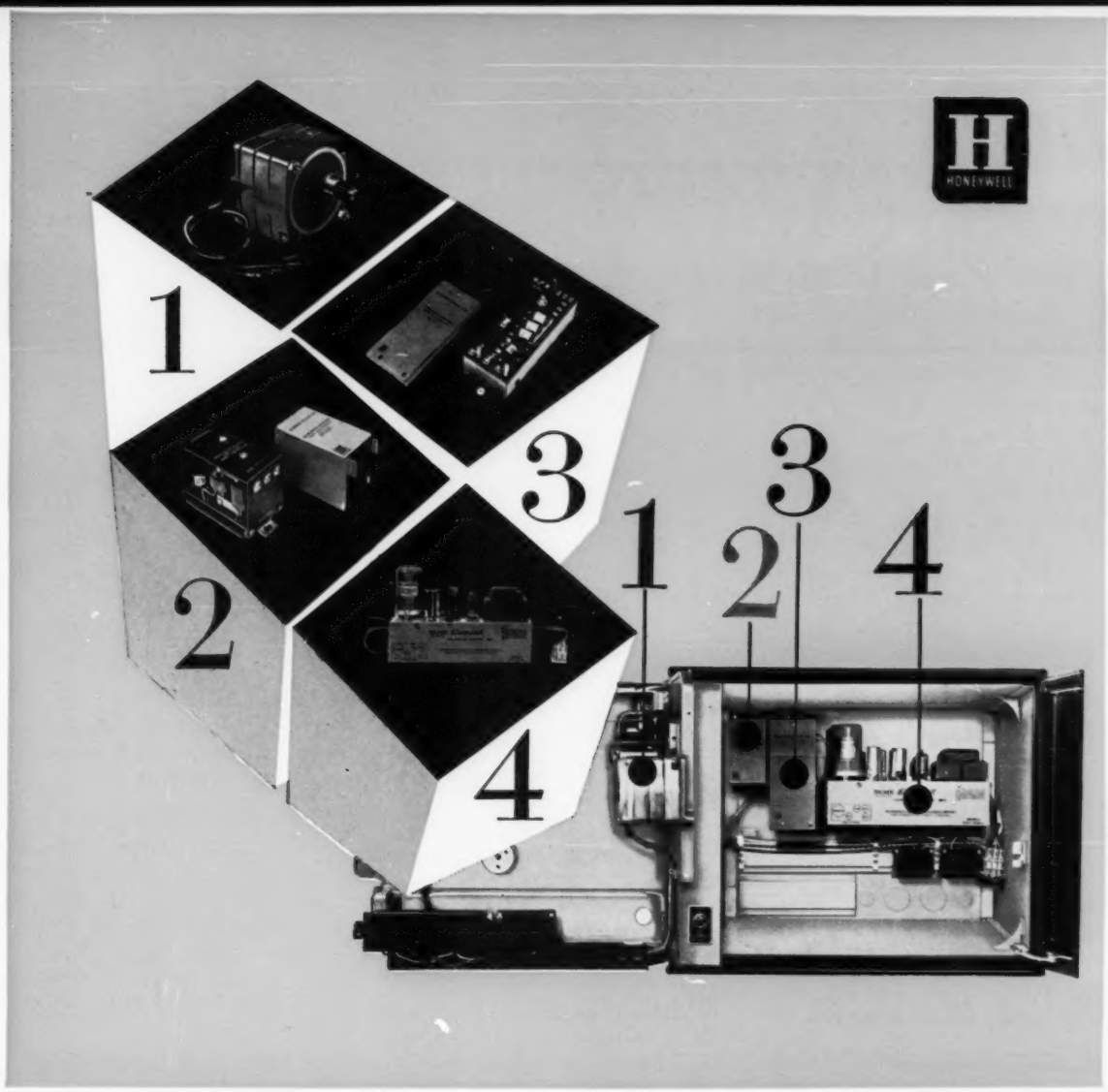
The compact unit is complete with atmosphere flowmeters, piping and valves.

For further information circle No. 41

Trade Fair Exhibit By Cincinnati Sub-Zero

In an effort to establish person to person contact between the United States and foreign businessmen, the United States Trade Missions Program, under the direction of the Department of Commerce, is participating in the International Trade Fairs and Expositions throughout the world. Currently on

Continued on page 42



It's what's in the modules that matters!

Take the newly designed modules in ElectroniK 15 Potentiometers. These modules have operating and servicing features that represent the very latest developments in the art of reliable instrumentation—**1.** Sectionalized motor module makes servicing a snap. Any major part of the servo or chart drive motors can be replaced in a matter of minutes. **2.** Line-powered constant voltage module provides a completely automatic d-c voltage source and replaces batteries, standard cells, and standardization mechanisms. **3.** Quick-change measuring circuit module reduces range or actuation changes to simple screwdriver operation. **4.** Quick-connect amplifier module is easily removed for servicing. Over 15 models available—for gain up to 40 x 10^6, for input impedance of 400 to 50,000 ohms.

Get complete details by contacting your nearby Honeywell field engineer today. Minneapolis-Honeywell, Wayne and Windrim Avenues, Philadelphia 44, Pennsylvania. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Honeywell

First in Control SINCE 1885

HONEYWELL INTERNATIONAL Sales and Service offices in principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan,

For further information circle No. 43

MANUFACTURERS' LITERATURE

For your copy circle the number on the Readers' Service Card

An Eight Page Booklet from Cincinnati Milling Machine Company describes the firm's MG Inductron and its uses for tempering, selective hardening, annealing, brazing, etc. The brochure includes construction details and facts about work handling mechanisms.

For further information circle No. 44

A Comprehensive Catalog of national standard abrasive belts, rolls, sheets and discs is available from The Carborundum Company, Niagara Falls, New York. The book lists standard coated abrasive products used throughout the industry. It also points out how the book can be used as a customer tool to help cut costs and expedite service through use of standard catalog items.

For further information circle No. 45

Sunbeam Bulletin 14 describes the advantages and features of the new Sunbeam continuous draw furnace for continuous drawing of ferrous and non-ferrous metals. The six page booklet is illustrated with diagrams and a specification table.

For further information circle No. 46

Metal Resistance Wires for high temperature furnaces and custom made platinum wound furnaces are described in a new booklet from the Baker Platinum Division of Engelhard Industries, Inc., Newark, New Jersey. The folder lists the various precious metal resistor wires in common use, and gives their properties and range of application for future temperatures to 1800 C.

Custom made furnaces are offered by Engelhard to meet specific length of heat zone, size of muffle and maximum temperatures to 1800 C.

For further information circle No. 47

A Four Page Specification Sheet describes a line of cam-operated program controller-recorders available from Minneapolis Honeywell Regulator Company, which control process programs, cut into plastic cams and record them on circular charts. Various types of pneumatic, electric contact, or electric proportional control are described.

For further information circle No. 48

Gilmore Diamonds distributed by F. F. Gilmore Company, Boston, contains information on hardness testing diamonds for instruments using the Rockwell method. The handsomely illustrated catalog tells the reader which tool is just right for every job and how to determine what to use in this highly exacting work.

For further information circle No. 49

Bulletin GER-1751 is a four page publication from General Electric explaining how to prepare an economic study on heat processing furnaces. The text includes sections on where to obtain data, how to make the study, a table showing items to consider in the studies, as well as typical examples.

For further information circle No. 50

An Application Data Sheet, describing the use of its Process Vapor Fractometer to control the atmospheres in metal heat treating plants, has been published by the Instrument Division, Perkin-Elmer Corporation, Norwalk, Connecticut. An application sheet describes the general problem, details the analyses that can be made using the Process Vapor Fractometer, and lists the instrument and components required to perform the analyses.

For further information circle No. 51

Bulletins #115 & 116

The Cambridge Wire Cloth Company, Cambridge, Maryland, has issued two new six page bulletins describing its products.

Bulletin #115 describes and illustrates the various types and grades of industrial wire cloth that are available from Cambridge and also contains a complete listing of trade definitions to help the reader understand the terms most frequently used in the specification of wire cloth.

Bulletin #116 describes and illustrates typical specifications of metal-mesh conveyor belts and also shows a number of actual installations.

For further information circle No. 52

A Bulletin describing Illinois Testing Laboratories' Alnor precision dew point indicator gives details for use of this unit which is reported to guarantee high accuracy, quick readings and complete portability. The brochure also describes how to use the Alnor dew point calculator.

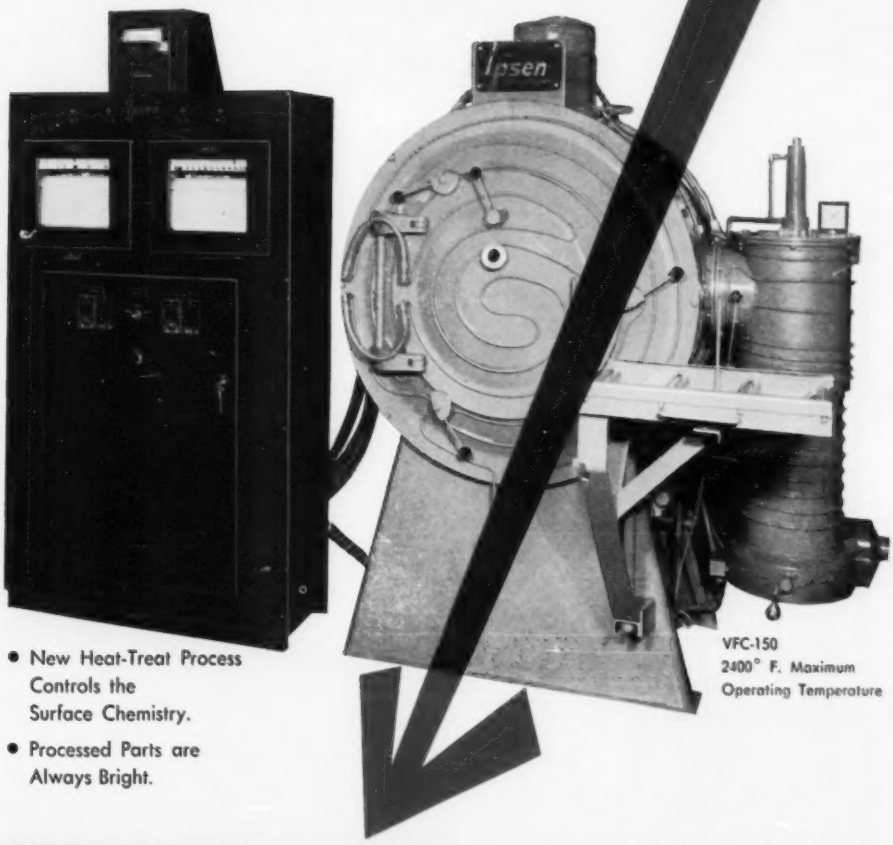
For further information circle No. 53

Reprints of "Heat Treatable Steel-Bonded Carbides" are available from Sintercast Division of Chromalloy Corporation, West Nyack,

Continued on page 41

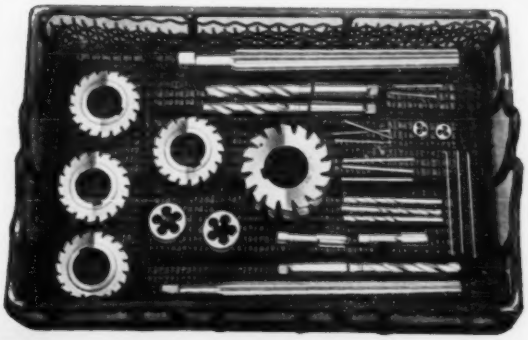
new process heat-treats high speed steel

AT 1/2 SALT BATH COSTS, PRODUCING CLEAN, BRIGHT PARTS!



VFC-150
2400° F. Maximum
Operating Temperature

- New Heat-Treat Process Controls the Surface Chemistry.
- Processed Parts are Always Bright.



BRIGHT HARDENING M-2 TOOLS

- Reamers, drills and cutters of various sizes were run together in the above vacuum unit.
- Preheat 1550° F. High Heat 2250° F.
- Surface Condition — Clean and Bright as shown in photograph taken after treatment.

See this process. Call for an Ipsen representative to give you full details.

AUTOMATIC **Ipsen** HEAT TREATING UNITS

IPSEN INDUSTRIES, INC. DEPT. 723 P.O. BOX 500 ROCKFORD, ILLINOIS

For further information circle No. 55

A REPORT FROM ENGLAND

Concluded from page 19

The loading table is built as a fixture on the right hand side of the track immediately opposite the quench tank. To simplify loading operations, the table is the same height as the hearth. The top is pivoted just off balancing point, so that on being unlocked, it will swing down on the right side, into a vertical position, giving the necessary clearance for the hearth door during quenching operations.

Automatic temperature control is provided through use of a potentiometric indicating controller which is fitted on a small control panel at the rear of the furnace. It is connected by a length of compensating cable to a platinum-platinum rhodium thermocouple arranged in the center of the roof. A motorized air valve with integral by-pass is actuated by this instrument. Fitted into the circuit is a red and green signal lamp.

In the event combustion air supply is interrupted by failure of the fan, a highly dangerous condition could arise, since concentration of unburned gas would accumulate in the furnace chamber, with the danger of an explosion. Similar conditions would arise in the event of a temporary interruption followed by restoration of the gas supply as the burners would be extinguished.

As a precaution against such failure the furnace has a simple but effective safety system consisting of pressure switches fitted on the air and gas mains.

● ● ●

NEW FRENCH ACHIEVEMENT

Concluded from page 17

batch from the quenching machine and to bring it into the drawing furnace.

For isothermal annealing, the batch would be first carried into a special ventilated box to undergo a fast fall of temperature before the processing. The batch will be then taken along, under the same conditions, to the cooling area. At this time it will be split up for the subsequent operations of inspection of the parts, shot blasting, eventual gauging and delivery.

From the preceding we may conclude that this company has developed a unique installation in the field of commercial heat treating by meeting perfectly the three main requirements of the treatment of unmachined parts:

high quality
very short times of delivery
lowest cost prices. ● ● ●

New York. The paper was presented at the 16th annual meeting of the Metal Powder Industries Federation. The article discusses the significant physical and mechanical properties of Ferro-Tic C, including machinability and hardening under heat treatment. Also listed are specific applications for the material in tooling and as wear-resistant inserts.

For further information circle No. 54

Blue M Electric Company's complete line of equipment is graphically shown in a 64 page two color miniature catalog. Photographs and condensed descriptions are included for Blue M standard equipment, giving sizes, temperature ranges, voltages and capacities.

For further information circle No. 57

A Wall Chart pointing out various ways to reduce costly wear and tear of conveyor belting through proper maintenance procedures is available free from Hewitt-Robins, Stamford, Connecticut. Subjects covered include: storage, record keeping, alignment, impact idlers, drive pulley lag, loading chute, skirting rubber as well as a number of others. A brief description of the composition of belting is provided.

For further information circle No. 58

An Order Sheet which lists bulletins describing Reichert metallurgical microscopes and metallographs is available from William J. Hacker Company, West Caldwell, New Jersey. The form lists two major categories for its many instruments: industry and the biological sciences. The Reichert line consists of microhardness testers of the inverted type and all the necessary attachments for photomicrography and high temperature microscopy.

For further information circle No. 59

A 24-Page Illustrated Handbook which shows how and where savings can be made in precision finishing costs through the use of Liquamatte wet blasting is available from Lord Chemical Company, York, Pennsylvania. The book describes the way hand finishes can be achieved mechanically at low cost in a great variety of production processes, providing a guide with which to analyze finishing operations. The book lists 40 precision finishing operations through which use of Liquamatte wet blasting has cut costs.

For further information circle No. 60

A New 23 Page Catalog describing high vacuum systems, instruments and valves is available from F. J. Cooke, Inc., South Norfolk, Connecticut. Featured under systems are high temperature, cold jacket furnaces and special purpose vacuum evaporators. The instrument section includes an ionization gauge control with automatic range switching.

For further information circle No. 61

A Design Catalog Sheet on United Electric Controls Company's Type E36N indicating temperature control shows applications, construction features and fully describes control ranges. The sheet comes punched for three ring binders.

For further information circle No. 62

NEWS TO HEAT TREATERS

Continued from page 36

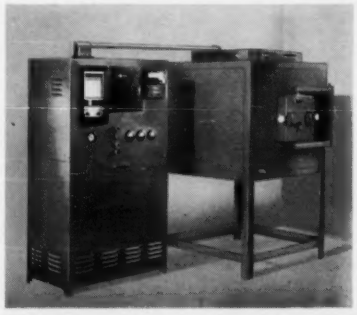
the schedule is the India Industries Fair in New Delhi, India, which started November 15 and will last for three months. A complete tool shop and metal treating facility were set up and will be in continuous operation for the duration of this Fair.

Cincinnati Sub Zero Products' ultra low temperature equipment will be an integral part of the processes to be shown. Large chilling chambers, which operate at temperatures in the range of -150 F. to -200 F. are used as part of modern heat treat methods, and the exposure to low temperature adds strength and dimensional stability to metals. The unit will also be used to demonstrate simplified assembly methods in which parts are shrunk by low temperature, and then fitted together to form a firm bond without the use of keyways, or other locking devices.

For further information circle No. 42

Kanthal-Super Models

A complete line of Kanthal-Super furnaces has been announced by Harrop Precision Furnace Company,



Columbus, Ohio. These furnaces are equipped with kanthal super heating elements made from molybdenum disilicate, and are uniquely suited to two types of operating conditions: firing in oxidizing or nitrogen atmospheres in the temperature range from 2600 F. to 3000 F. and firing in atmospheres containing CO or H_2 up to 2730 F.

The hearth of each Harrop Kan-

Continued on page 44

NEWS TO HEAT TREATERS

Continued on page 42

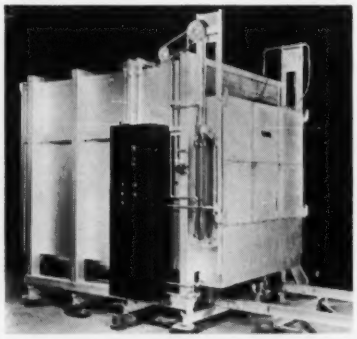
thal-Super furnace, except the smallest model, MS-7, is raised above the floor to expose the complete load to radiation and to facilitate heat transfer.

Standard models of Kanthal-Super furnaces are available in three forms: cabinet models, elevator models and shuttle kiln models.

For further information circle No. 65

Waltz Units Feature Heavy Duty Design

Heavy duty construction, necessary to assure longer life and trouble free service under present day heavy volume production, is a feature found on industrial furnaces made by Waltz Furnace Company, Cincinnati.



A typical example of the structural sturdiness of Waltz Furnaces is electric heated car bottom furnace, model WF-12824-CBE, shown here. This unit is 48 in. wide by 32 in. high by 96 in. long. Its electrical characteristics are 440 volt, 60 cycle, 3 phase, 150 KW.

The furnace is provided with an easily operated floor mounted control panel which regulates both temperature control and electrical circuits from one board. Any type of control system may be provided to suit individual needs.

For further information circle No. 68

Cold Jacket Assembly

A cold jacket vacuum furnace that has been operated continuously at 2500 F. is available from F. J. Cooke, Inc., South Norwalk, Con-

necticut. The unit is heated internally by six pair of tungsten strips suspended by water cooled low thermal loss feed throughs. The heaters are surrounded by concentric tungsten

and molybdenum radiation baffles and the entire assembly is placed in a water cooled vacuum jacket.

Heat zone of the unit is 3½ in. diameter by five in. high. A 40 KW saturable core reactor control makes available sufficient power to process up to four pound loads.

The unit is reported suitable for sintering, melting and annealing of high temperature metals and degassing of metals and ceramics.

For further information circle No. 69

Infra-Red Representative

Rex Radiant, Inc., Cleveland, has appointed the Combustion Division of Eclipse Fuel Engineering Company, Rockford, Illinois, as exclusive United States and export sales representatives for Infra-Line gas-fired infra-red burners.

Infra-Line radiant burners are designed for a variety of commercial and industrial infra-red process heating applications, including clay and ceramic drying, chemical processing, curing or drying paints and a number of other uses.

In addition to handling the sales of Infra-Line burners, the combustion division also will provide complete application and engineering assistance to meet special requirements for infra-red process heating systems.

For further information circle No. 70

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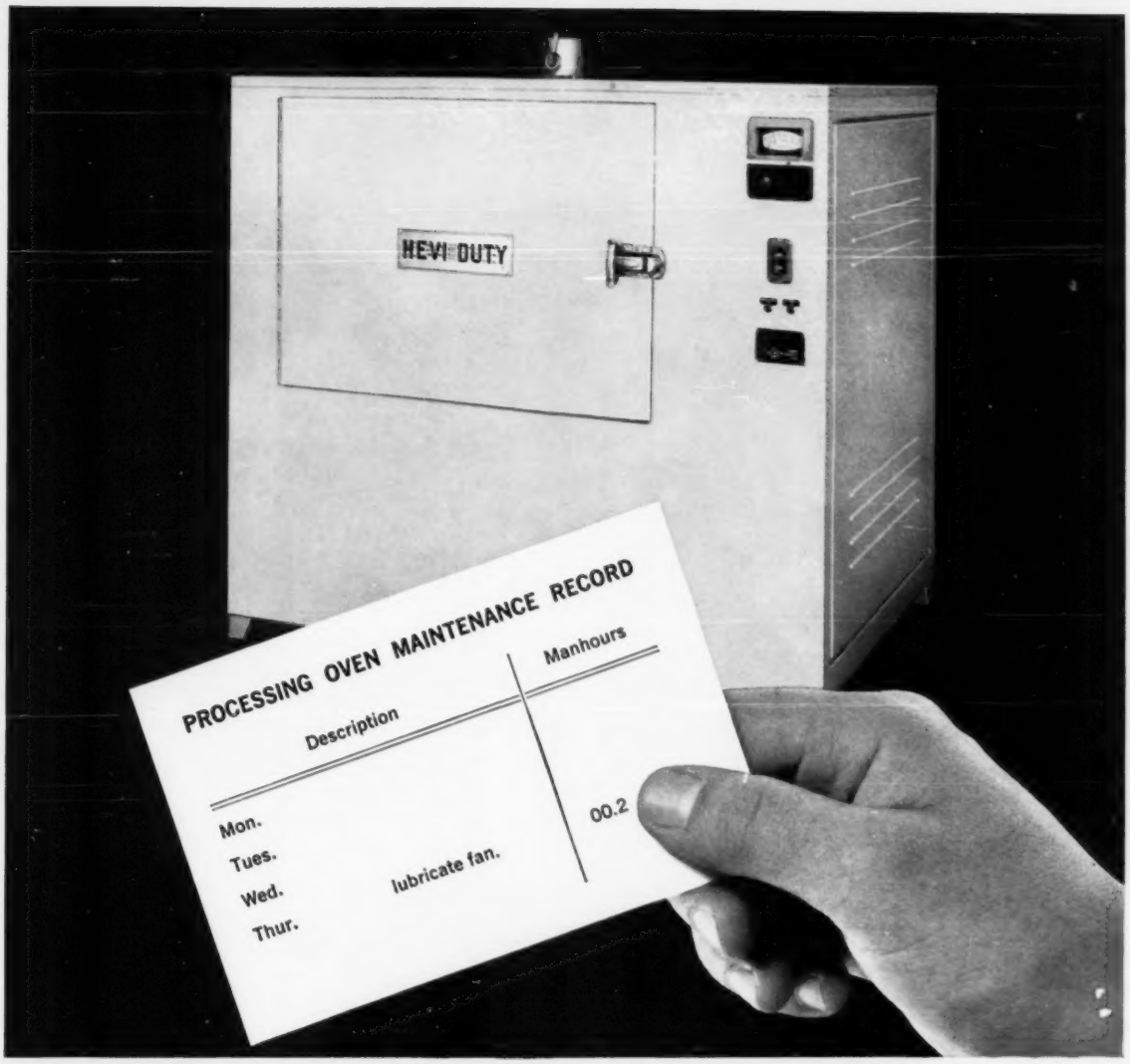

we made both look better

New Hevi-Duty tray-loaded processing ovens (to 1250° F.) combine attractive appearance with easier maintenance, greater efficiency

Beneath the attractive, 14-gage steel exterior of these new ovens, you'll find a host of design refinements that simplify maintenance . . . improve efficiency and reliability.

You can get at the entire circulating and control system by releasing just one captive screw and one panel. For greater efficiency, a high-volume, cross-flow circulation pattern assures uniform heat transfer with minimum temperature drop. To simplify material handling, tray supports are spaced six inches apart. Standard trays can support a load of twenty pounds per square foot.

Another refinement: heating, control and circulation circuits are *individually* fused. Magnetic starters provide low-voltage dropout protection for electric motor circuits.

These new ovens are available in electric and gas-fired models, in temperature ranges of 600°, 850° and 1250° F. Many models are carried in stock. Request Bulletin 7101. For information on the complete line of Hevi-Duty ovens for industrial and laboratory applications in both gas-fired and electric models write Hevi-Duty, Watertown, Wis.

HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

Hevi-Duty Electric Company, Watertown, Wis.

A Division of Basic Products Corporation

H-44-61

For further information circle No. 73

IN HEAT TREATING HIGH - SPEED STEELS

. . . No other method including vacuum heating matches salt bath speed, quality of results, uniformity and freedom from localized overheating, gain growth, distortion and excessive carbide solution!

This commercial heat treaters' high-speed Ajax salt bath installation has meant

Uniform...Decarb-free...Straighter Work

HARDENED 2 TO 3 TIMES FASTER!

When Benedict-Miller Inc., well-known commercial heat treaters of Lyndhurst, N. J. installed their Ajax high-speed salt bath furnace they expected a lot in the way of better, lower cost results—and got even more! Here, after 3 years of constant use, is the way it stacks up:

WORK HANDLED IN 50% - 75% LESS TIME!

Regardless of size, shape or type of high-speed work, loads are handled in from 2½ to 4 hours as compared to 7 or 8 hours previously.

CHEAPER FIXTURES..... FASTER FIXTURING

Costly special alloy trays that necessitated painstaking fixturing of the work have been replaced with simple, easily-loaded carbon steel fixtures.

OUTSTANDING RESULTS ON T-TYPE COBALT STEELS.....

Hardness of R_c 66-68 is consistently obtained on critical cobalt steels such as T_2, T_4, T_5 and T_6. Decarburization is not a factor. Finish grinding is seldom needed. (Previously a minimum of .010" had to be allowed for grinding even though protective coatings were used on the work to reduce decarburization.)

PLUS THESE ADDITIONAL ADVANTAGES!

The same Ajax furnace and the same salt operate at any required temperature between 1750° and 2350°F. . . .

One daily rectification maintains bath neutrality. . . .

Partial hardening can now be done as needed. Because salt bath heating is so much faster than other methods, there is no danger of oversoaking light sections of pieces of varied thickness . . .

. . . And furnace maintenance has been lower than their best expectations.

AJAX

SALT BATH FURNACES

Internally heated electric and gas-fired types

AJAX ELECTRIC COMPANY

940 Frankford Avenue Philadelphia 23, Pa.

Foreign Licensees: SWEDEN: AB Max Sievert, Stockholm. ITALY: Italforni, Milan. GERMANY: Otto Junker GMBH, Uber Aachen 1. BELGIUM: Ateliers de Construction Electriques de Charleroi, Herstal.

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